Vo. XXVIII NEW YORK—THURSDAY, MAY 29, 1913—CHICAGO No. 22

The AUTOMOBILE

Indianapolis

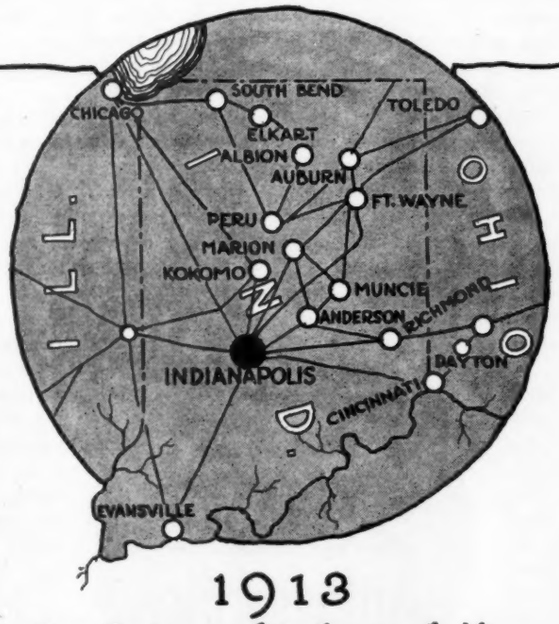
A City Where Pulling Together Has Brought Results

By L. V. Spencer

INDIANAPOLIS, first city of Indiana, enjoys the distinction of having within its boundaries more 18-karat boosters for the automobile than any one community in the United States. Its citizens have done more to make the whole subject of motoring and its allied topics widely discussed than have any other. They have promoted one automobile event after another until today, though not the largest city in the production of cars and their parts, the city is exceedingly well known by the automobile public as a manufacturing center.

Among cities of the United States, Indianapolis ranks third in the number of finished automobiles and their parts to be given to the world each year. Realizing that the Michigan city had several years the start of them in the matter of production, the Hoosiers set out to make their city equally prominent in the world of gasoline, sagaciously choosing other lines of endeavor which have netted big returns.

Just now the eyes of the motoring world are centered on Indiana's capital, for this week the cream of the world's speed creations will be piloted around the 2.5-mile Speedway



1913
16.360 — Automobiles
1912
12.375 — Automobiles
1911
7.275 — Automobiles

Twelve Automobile Makers
Thirty-four Parts Makers

in what bids fair to be the greatest 500-mile automobile race yet staged. Speed kings of this country and of Europe will vie for the rich prizes which the enterprise of a wide-awake city has posted as bait for the world's best. Fifty thousand dollars, which is to be split in ten pieces—the winner to get $20,000—has been offered and the Hoosiers feel that it is cheap, when the great amount of publicity which the city will reap and the thousands of spectators and motoring converts who will be drawn there for the race, are considered.

The Indianapolis Speedway project was announced in January, 1909, its plans originating with Carl G. Fisher, of Transcontinental Highway fame. An association was formed and the Speedway built at a cost of over $350,000 on the outskirts of the city, though being easy of access by two automobile roads, one traction line and two railroads. Its exact location is 4.5 miles northwest of the city.

The plot of ground on which the Speedway is located covers 328 acres and has on it forty-one buildings, including garages, aerodomes, hangars and the like. While the grand-

Panoramic view of part of the great Indianapolis Speedway, where the most daring and skilful racing drivers of Europe and America will strive

stands and boxes afford accommodations for 60,000 persons, the entire grounds will afford room for nearly 200,000 people. In addition, there is a parking space for 10,000 automobiles.

Since the holding of the International Sweepstakes races, the city has been the Mecca for motor car touring parties. One has to but examine the licenses carried by a part of the great collection of motor vehicles parked at one of these races to realize that nearly every state in the Union now has its motoring enthusiasts.

A word as to the actual construction of the track itself may be of interest. It has a surface of vitrified brick, 3,500,000 of these being required to cover the 2.5 miles. The turns, with a radius of 1,500 feet, are banked 16 feet, and a cement wall, 3 feet high and 11 inches thick, extends around the outer edge of these turns. Heavy wire mesh protects all stands from the track. Telephone lines connect all score-boards on the back stretch direct with timers' and judges' stands so that persons on any part of the track are told the standing of all participants in the events at any time. Thirty sets of telegraph instruments tell the outside world the progress of the speeding cars.

Yet the Speedway has not been the only agent Indianapolis has used to get into the automobile limelight. Through its Four-States tours, Coast-to-Coast runs, the activities of the Hoosier Motor Club, and the doings of an energetic Automobile Trade Association, the city has been placed upon the motoring map in big letters.

The idea of touring through four neighboring states each year was original with the city. The first tour of this sort was announced in April, 1911, and started July 16, covering a distance of 1,431.9 miles through the four states of Illinois, Iowa, Missouri and Indiana. The run was restricted to car manufacturers in Indiana and the object was purely a social and boosting affair. So much importance was attached to the affair that the then governor of Indiana, Thomas R. Marshall, pushed the button to start it. In this initial affair there were twenty-seven machines. The event is particularly notable from the fact that it was the first time in the history of the automobile industry that the automobile manufacturers of one state had banded together in such a movement.

The second of these tours, held last July, was made through the four states of Ohio, Kentucky. West Virginia and Indiana. Its mileage was 1,423. Thirty-three cars participated.

The 1913 tour, scheduled for July 1 to 25, will be replaced by a run to the Pacific Coast exclusively for Indiana manufacturers.

The Premier Coast-to-Coast run of 2 years ago attracted a great deal of attention. The participants were owners of these cars who started from Atlantic City on July 26, 1911, by dipping the wheels of their cars in the waves of the Atlantic. Twelve cars finished by dipping the wheels in the Pacific at Los Angeles on August 10, 1911.

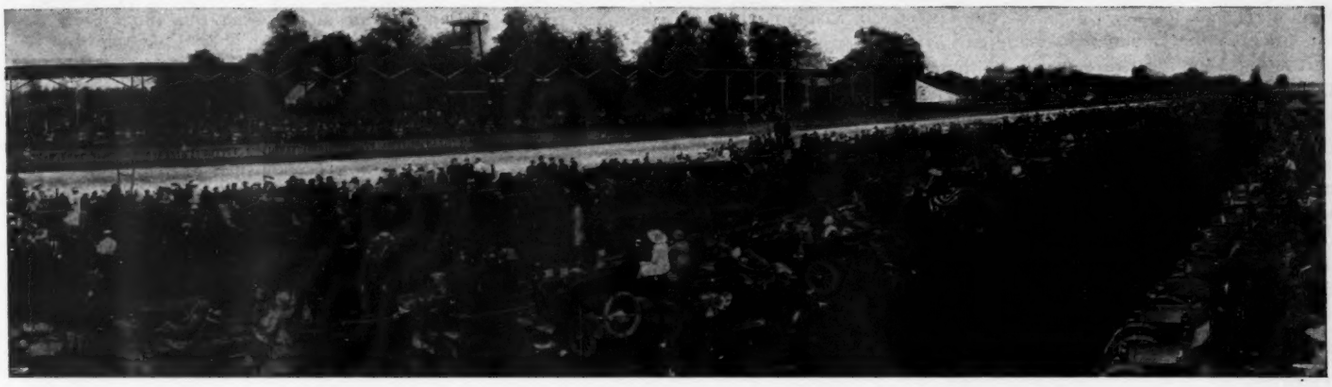
It is just such events as these which are continually being originated and staged by a group of men who are pulling together to advance their city and to bring fame to their product.

There is a spirit of fellowship running through the long list of makers of cars and parts gathered together in the Hoosier city which is very evident to the outsider. There is a get-together-and-push atmosphere which is bound to work to the advantage of all concerned.

Another instance of the progressiveness of Indianapolis was the establishment last June of Speedway, the horseless city, a municipality unique in its ideas for thorough modernity both from the standpoint of the buildings, which it is planned to erect, and from the fact that it is to be horseless in every sense of the word. No horses will be permitted within the new town, the brain-child of Carl G. Fisher and James A. Allison. These men have long wanted to see a city built devoted entirely to the automobile industry which would be ideal in every respect. All dwellings must be of concrete. Factories are also required to be of concrete construction reinforced with steel and up to the latest architectural dictates. Cars and trucks only may traverse the streets.

1906
2050
Automobiles
Indianapolis

The start of the second annual Four-States Tour, July 9, 1912, of the Indiana automobile manufacturers. It is



to lower the world's record in the great 500-mile race, May 30. The Speedway has done much to bring Indianapolis before the automobile world

During the early part of 1912 the two promoters of the project bought 1,000 acres of land, and after they had become thoroughly convinced of the feasibility of the plan of establishing a strictly motor car city it was made public to the world, attracting much attention.

The idea was not entirely a money-making proposition, but one which would further draw attention to Indianapolis and bring more power to it in a manufacturing way. Others have responded to the project and it has fast gained ground. The new plant of the Prest-O-Lite Co., consisting of twelve buildings, is located in Speedway, while half a dozen parts concerns and several motor car factories are to locate within its gates.

Industrially, Indianapolis may well be proud of its automobile and allied interests. There is a full dozen of the well-known motor car makers who have chosen the city for its many advantages. Situated at practically the center of population of the United States, it has an inexhaustible supply of cheap fuel, has competing steam and electric railroads in all directions, has plenty of labor of diversified character and plenty of room for this labor to live. In short, it has been characterized as the natural base from which to draw upon nearly all sources of raw materials. Its position is strategic as regards shipping to nearly all parts of the country.

Besides the twelve factories making motor vehicles there are thirty-four accessory and parts-making concerns identified with the city. This latter figure represents only those plants which are directly in the automobile class and devote either all or the greater part of their energies to the making of supplies and parts. It does not include such plants as those doing a more general business, such as the manufacture of bolts, nuts, screws and a hundred and one other articles which were just as necessary before the time of the motor vehicle as they are today when the making of such vehicles has grown to be one of the world's greatest industries. Were all of these added, the total would be swelled several fold.

The combined output of the dozen Indianapolis makers of all classes of motor vehicles for 1913 is approximately 16,400. This includes the electric output of the Waverley company—Indianapolis' only representative in the electric vehicle field—and the concerns making motor trucks. The total does not include the outputs of any concerns in the vicinity of the city, but exclusively those which may properly be regarded as belonging to Indianapolis.

During 1912 approximately 12,275 machines of all classes were produced by these same companies and for the year previous to this, 1911, about 11,000 machines were given to the world with the Indianapolis stamp on them.

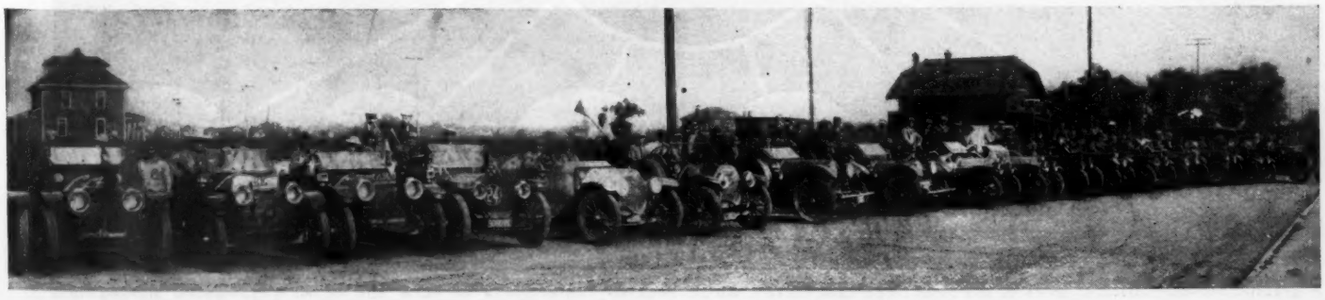
It is difficult to estimate the outputs for the years previous to 1911 as no statistics of this nature were kept; however, an idea of the increase in production which has taken place since the early days of the industry in Indianapolis results from a search through old files.

These show that the 1906 output of the five factories then operating was approximately 2,100 machines, having an aggregate value of $4,105,000. This estimated production for that year did not include the then recently established American Motor Car Co. It included the number to be made by the Pope Motor Car Co., Waverley department; the National Motor Vehicle Co., the Premier Motor Mfg. Co., the Marion Motor Car Co. and Nordyke & Marmon, several of the city's leading firms.

Thus, in the making of motor cars the city has kept pace with the growth of the industry as a whole, having in 7 years increased its output of motor vehicles by 680 per cent.

Comparison of the total value of the motor vehicles produced by the Indianapolis concerns from year to year is rather difficult inasmuch as complete data along this line are not obtainable. However, from statistics received from five of the leading motor car concerns in Indianapolis it is shown that $9,461,500 worth of cars were made by them in 1912. All told the city's factories probably turned out machines to the value of $30,000,000 for this period.

On the same basis, this year's output



largely to the energetic promotion of such affairs as this that Indianapolis owes her rapid rise as an automobile center

should reach a market value close to $41,000,000, assuming that the price of the Indianapolis-made car averages $2,500.

It is apparent from these statistics that the Indianapolis motor car maker has not gone in for quantity production to any great extent. Nevertheless, the factories are large in size. The twelve have an aggregate floor space of approximately 1,714,000 square feet; add to this the floor space of the parts factories mentioned and the total reaches 5,000,000 square feet, 4,582,200 square feet, to be exact, according to the records at hand.

The working population of Indianapolis is well represented in the city's factories in the automobile industry. At the present time, 13,990 wage-earners are thus employed. Of this number, 6,650 earn their livelihood from the makers of cars, while the balance of 7,340 are paid by the producers of parts and accessories. There seems to be little opportunity for comparison with the motor car industry working population of previous years, since no such records are obtainable. However, the present population of Indianapolis is 267,000, while in 1900 it was 169,000, an increase of 98,000, or 58 per cent. It seems reasonable to assume that the number of automobile and parts factory wage-earners has increased about twice as fast, and we may, therefore, say that in a dozen years the industry has been responsible for the bringing to the city of at least 10,000 more men of the wage class, or one-tenth of the population gain. If every other industry could have done as well, the city's growth would have been unprecedented.

On the basis of the present population, the wage-earning class chargeable to the motor vehicle industry composes 5.2 per cent of the total persons in Indianapolis, the number in the car-making factories alone, 2.5 per cent., and in the parts and accessory plants, 2.8 per cent., as shown in the table:

1900 population	169,000	Percentage of present population	5.2
1913 population	267,000	Percentage of present population in car-making factories alone	2.5
Increase	98,000		
Increase—per cent.	58	Percentage of present population in parts and accessory factories alone	2.8
Total wage earners—automobile industry	13,990		

The automobile business in Indianapolis dates back to about the year 1900, although much experimenting had taken place before that year. Records show that an electric vehicle—the first built by the Waverley company, then known as the Indiana Bicycle Co.—was delivered to Charles Finlay Smith in January, 1907. In May, 1898, the Waverley was one of the four makes of electric vehicles exhibited at an electrical show held at the Madison Square Garden, New York. In 1903 the Waverley company built the first coupé body ever placed upon an electric vehicle chassis. Those prior to this had all been of the Stanhope design.

Among the gasoline car makers, Nordyke & Marmon are perhaps the oldest Indianapolis manufacturing concern, as it was established in 1851 as a machinery manufacturing business. In 1901 the company built its first motor car. In 1904 several more machines were made. A year later the Marmon was placed regularly upon the market.

The first of the Nationals came along about this time. The Premier Motor Mfg. Co. may also be numbered among the pioneers, it having been formed in 1902, when its first car was constructed. The American Motors Co., the originator of the underslung type of construction, began experimental work on its first underslung model in the summer of 1906.

The Marion Motor Car Co. was established in 1903. The present holding company took over the Marion interests on the first of last August. Later came the Cole Motor Car Co., which began making cars in June, 1909. The Empire Automobile Co., formerly the Empire Motor Car Co., was formed in 1909. The Motor Car Mfg. Co., maker of the Pathfinder, started business in 1911. The Ideal Motor Car Co., the name of which has recently been changed to the Stutz Motor Car Co., was established in 1911 also, and it was about this time that the Mais Motor Truck Co. came into being to manufacture a motor truck designed by a German engineer of that name. The Henderson Motor Car Co. was formed last year. Thus we have the following chronological table:

Waverley Co.	1897	Cole Motor Car Co.	1909
Nordyke & Marmon	1901	Empire Automobile Co.	1909
Premier Motor Mfg. Co.	1902	Motor Car Mfg. Co.	1911
Marion Motor Car Co.	1903	Stutz Motor Car Co.	1911
National Motor Vehicle Co.	1904	Mais Motor Truck Co.	1911
American Motors Co.	1906	Henderson Motor Car Co.	1912

In the parts and accessories making clan there are many names well known to every motorist. There is the Wheeler & Schebler concern which is the world's largest maker of carbureters, and which started in business in 1901. It employs from 500 to 800 men, has a floor space of 300,000 square feet and last year turned out 300,000 carbureters. The daily capacity of this plant is 4,000 carbureters.

The Prest-O-Lite Co. started in business in September, 1904, and has a floor area of 250,000 square feet, employing over 400 men.

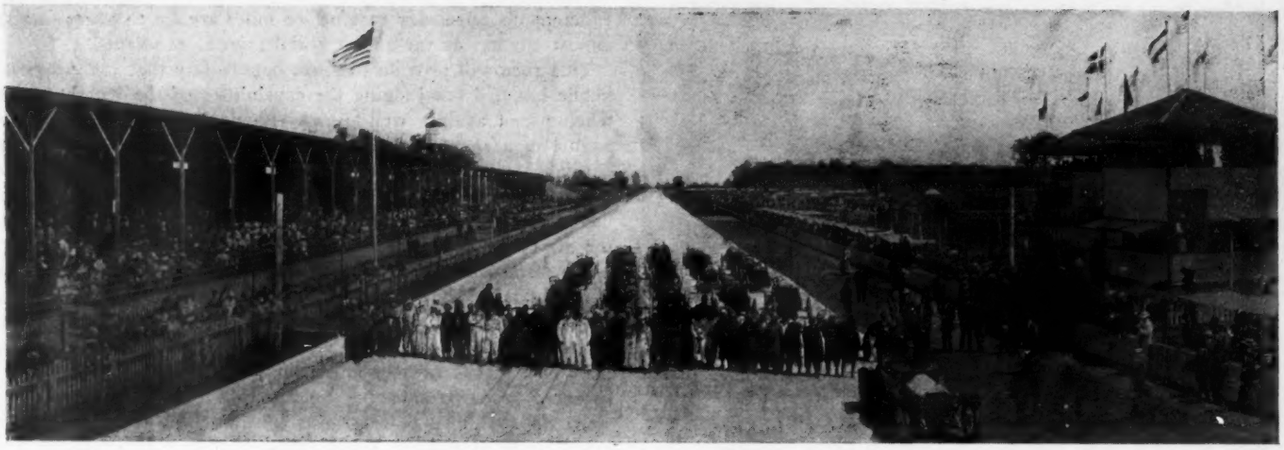
In the axle and transmission making field we find the Stutz Auto Parts Co. also claiming Indianapolis as its home. Maker of automobile machine parts is the Spacke Machine Co., formed in 1903 and now employing from 350 to 400 workmen on the average day.

High-speed chain makers are the Link-Belt Co., the Diamond Chain & Mfg. Co. and the American High Speed Chain Co., which furnish their product for automobile use as well as for other machinery constructions. The Keyless Lock Co., which recently moved into one of the most modern of bronze and aluminum foundries, is another of the many thriving concerns making specialties for the industry.

And so it goes on down the line. There is no end to the variety of motor car parts which bear the stamp of the Indianapolis-made.

These concerns and many others directly or indirectly connected with the automobile industry are operating on an enormous scale. Many others are not so large, but they are all thriving, each filling its niche in the great cycle of production.

A graphic representation of some of the most important factors which enabled Indianapolis to turn out 16,360 automobiles during 1912



Cars, drivers and mechanicians lined up before the start of the 500-mile race on the Indianapolis Speedway, May 30, 1912

Twenty-Nine Cars Ready for Big Race

ON Memorial Day, Friday, May 30, the third annual international Sweepstakes race will be staged at the Indianapolis Speedway. The entry list, which is limited to thirty cars, contains twenty-nine, and includes some of the fastest cars in the world driven by drivers of world-wide reputation. This classic speed event is indeed international in its scope, for no less than five nations are represented, including England, France, Germany, Italy and the United States.

In addition to the international flavor of this great speed event, this race will prove particularly strong for several of the following reasons: Among the eight foreign entries are the English Sunbeam and the French Peugeot which have been making such remarkable performances in Europe during the last 2 years. Another feature is that of the introduction of the Knight engine to American racing competition. Last, but not least, whereas in previous races cash prizes amounting to not more than $20,000 proved most attractive, the winner of this race, taking the value of trophies into consideration, has a good chance to win $35,000.

SUMMARY OF CARS ENTERED IN 500-MILE RACE

No.	Car	Driver	Cylinders	Horsepower
1	Nyberg	H. Endicott	6	38.40
2	Stutz	Charles Merz	4	38.25
3	Stutz	G. Anderson	4	38.25
4	Keeton	Burman	4	42.20
5	Mason	Evans	4	30.65
6	Mason	Tower	4	30.65
7	Deltal	E. H. Delting	4	44.20
8	Stutz	Herr	4	38.25
9	Sunbeam	Guyot	6	29.45
10	Henderson	Knipper	4	29.00
12	Fox	Wilcox	4	36.15
15	Peugeot	Zuccarelli	4	29.00
16	Peugeot	Goux	4	29.00
17	Anel	Liesaw	4	32.40
18	Schacht	Jenkins	4	38.25
19	Mercer	Bragg	4	38.25
21	Mercer	De Palma	4	38.25
22	Mercer	Wishart	4	30.65
23	Mercedes-Knight	Pillette	4	16.92
24	Pennebaker	Pennebaker	4	42.20
25	Tulsa	Clark	4	36.15
26	Isotta-Fraschini	Grant	4	36.15
27	Isotta-Fraschini	Tetzlaff	4	36.15
28	Isotta-Fraschini	Trucco	4	36.15
29	Mercedes	Mulford	4	32.40
31	Case	Disbrow	4	42.20
32	Case	Nikrent	6	46.00
33	Case	Endicott	4	27.20
35	Mason	Will Haupt	4	29.00

The qualifications for the race are that cars must not exceed 450 cubic inches piston displacement, must have a minimum weight of 1,600 pounds and shall be able to do 75 miles an hour. In last year's time trials all of the cars but one succeeded in making this speed and, barring accidents, in practice it is reasonable to expect that all of the twenty-nine cars entered this year will line up at the starting point.

Considerable interest is being taken this year in the Sunbeam and Peugeot cars. The Sunbeam six-cylinder car now holds the world's records for 600 miles, 700 miles and 800 miles, all of which were made in 1911 on the Brooklands track at an average speed of a little more than 75 miles an hour. This car also holds the 7, 8, 9, 10 and 11-hour records, also established in 1911 on the Brooklands track. This car will have to increase its speed considerably, however, in order to win the Speedway race this year, for it is predicted that even greater speed than that of 78 miles per hour made in last year's race will be required to win this race of 1913.

As for the Peugeots, they have indeed everything in the way of prestige as a result of the world's records established by the Peugeot car driven by Boillot and Goux at Brooklands during the last few months. In April of this year several interesting records were established by Goux in a Peugeot car. The Talbot record for 50 miles in 29 minutes 2.5 seconds, which is equivalent to 103.3 miles per hour, was beaten by Goux's Peugeot which negotiated the 50 miles in 28 minutes 18.65 seconds, which is equivalent to 105.97 miles per hour. On the same day the Talbot records for 100 miles and the hour also were beaten. The Talbot's record of 100 miles in 57 minutes 49.38 seconds, or 103.76 miles per hour, was lowered by the Peugeot, which made the distance in 56 minutes 29.93 seconds, or 106.20 miles per hour.

These are indeed remarkable records, but it must be borne in mind that these records are only for 100 miles and were established on a track which is much easier on tires than the Indianapolis Speedway. Soon after these results were achieved at Brooklands these cars were forced to stop to make tire changes; and it is a well-known fact that numerous tire changes in the

Ralph De Palma in the special racing Mercer in which he will endeavor to overcome his frequent hard luck at Indianapolis this year by hard and consistent driving

George H. Clark mounted on his Tulsa racer, as he will appear in the annual 500-mile race on Memorial Day. The Tulsa is an Oklahoma car and is named after its native city

Spencer Wishart in his special Mercer ready for the 500-mile grind. Wishart's car differs from the other two Mercers in that the exhaust line is carried outside of the hood on the right side

Ralph Mulford in his big Mercedes all ready for the 500-mile contest, smiling his famous smile, which is unassuming in victory and undaunted in defeat

Don Herr and his Stutz, one of the team of three cars of this make which will strive to capture first place and as many other places as possible in the big Indianapolis classic

Indianapolis Speedway race of 500 miles are apt to prove fatal to almost any car as far as the grand prize is concerned.

This race will provide the first opportunity that the American public has had for judging the capabilities of the Knight engine when pitted against well-known exponents of the poppet-valve engine in a speed event, and it is needless to say that its performance will be watched with great interest. To add to the interest in this respect one of these cars, the Mercedes-Knight, has a four-cylinder engine, while the other is an exponent of the six-cylinder idea.

A substantial increase in the cash prizes offered for the first ten most successful cars in this event, has resulted in bringing together most of the best drivers in the world, and considering, both drivers and cars, it is very reasonable to believe that Joe Dawson's record of 78.7 miles per hour will be lowered and a speed of 79 or 80 miles per hour attained.

To the first man to cross the finishing line will be given the grand prize of $20,000, while the second man to cross the line will receive $10,000. For the next eight to follow him prizes of $5,000, $3,500, $3,000, $2,200, $1,800, $1,600, $1,500 and $1,400, respectively, will be given. In addition to these, the Motsinger company offers $1,000 to every driver who finishes within the first ten having a motor equipped with Motsinger carbureter. Findeisen & Kropf offer $1,000 in gold to the winner if his car is fitted with the Rayfield carbureter, and also the Rayfield cup, which is valued at $2,000; the Wheeler & Schebler Co. also offers $1,000 to the winner providing he uses the Schebler carbureter. As in previous years, the Bosch Magneto Co. will give three prizes of $500, $300 and $200 to the winners of first, second and third places, respectively, providing the cars are equipped with the Bosch magneto. Emil Grossman & Co. offer $500 to the winner, providing he uses Red-Head spark-plugs and the Hartford Suspension Co. will give prizes of $250, $150 and $100 to the winners of first, second and third places, respectively, providing Truffault-Hartford shock-absorbers are used on their cars. In addition to these cash prizes, the great Wheeler & Schebler cup, which is valued at more than $10,000, is offered for the first car to finish 400 miles. The Prest-O-Lite solid silver brick will be given to the first to finish 300 miles, and for the first to finish 200 miles the Remy Brassard will be given with a salary of $50 a week for 6 weeks. Altogether, it is possible for the winner of the race to come away with cash and trophies valued at more than $35,000.

Five Three-Car Teams

In this race there will be five teams of three cars each, which include the Stutz, Mason, Mercer, Isotta and Case, while the Peugeot has two entries. The Stutz team will be represented by a veteran Stutz driver in Gil Anderson and two excellent drivers in Merz and Herr, who have been recruited from the ranks of National pilots. Anderson has been handling racing cars since 1909, when he participated in the Crown Point and other races, but it was in the 500-mile race of 1911 that he earned a reputation for himself and the Stutz when he finished the 500 miles in the eleventh place. He also was a starter in the 500-mile race of 1912 in a Stutz car, so he should really know his car and the peculiarities of the track better than any other driver, for there are no others who have driven the same car in the two previous races.

Burman, who came into prominence in 1909 as a driver of the Buick cars and as winner of the Prest-O-Lite trophy at Indianapolis, afterwards became one of the best-known racing drivers in America as a result of his many remarkable performances with the Blitzen Benz. With this car he established and still holds all the A. A. A. records from the quarter mile, half mile kilometer and mile straightaways and speedways and the 1-mile for the dirt track.

Evans, who has never had an opportunity of driving a really fast car, nevertheless has a good record for consistency as a pilot for small cars and has won quite a number of competitions among the small car events.

Tower is another driven in Evans' class who has driven small cars for some time and came into prominence during the Beach races at Jacksonville in 1911, when he succeeded in winning three events.

Merz is well known on the Indianapolis Speedway, for it might be said that he was practically born and raised with it. He came into prominence in 1911 as a driver of the National car when he won a class event and was second in the free-for-all of the Panama-Pacific Race and Carnival at Oakland, Cal. Since then he has added to his laurels by coming in second in the Illinois Trophy race of 1911 and in winning the same race at Elgin in 1912. His team-mate, Herr, is also driving a Stutz in this year's event. He became famous as a racing driver in 1911 when he succeeded in piloting the victorious National in the Illinois Trophy event of the Elgin National Stock Chassis Road Race.

The Mercer team comprises three of the best racing drivers in America. De Palma is the most famous of this trio, having been the champion all-around-race driver of 1912 and being the holder of the 50-mile record for 1-mile circular dirt tracks and the 20-mile Class B Speedway record. He is one of the most sensational drivers in the world and perhaps the most capable in getting the maximum speed out of a car and holding it on the road at terrific speeds. In last year's 500-mile race, after leading up to the second from the last lap, he was forced to drop out of the competition as a result of engine trouble and he should be a very strong contender in this year's event.

Bragg, as winner of the Grand Prix in 1912, also occupies a prominent place among the most reputable drivers. He also has to his credit all of the American speedway records of from 2 to 5 miles, which were made in a Fiat at Los Angeles in 1910 and 1912.

Wishart, whose principal victory was at Fairmount Park, Philadelphia, in 1911, has won considerable prestige as a driver of Mercedes cars, having made most consistent performances with this machine in previous Speedway events and many other events throughout the country during the last 4 or 5 years. He also has to his credit the 75, 100 and 150-mile records for the 1-mile circular dirt track in a Mercer.

Isotta Has Formidable Team

The Isotta team also has two of the greatest drivers in America in Grant and Tetzlaff. Grant, who has twice driven the Alco car to victory in the Vanderbilt Cup Race, and who in the same car was second in the big race at Elgin in 1911, is recognized as one of the most competent drivers in the world and his performance in this year's 500-mile race will be watched with considerable interest.

Tetzlaff has never had anything but hard luck in his Middle West and Eastern competitions, but in the Far West he reigns supreme. He was winner of the most important event at Santa Monica in 1910 and also at Tacoma in 1912, while three events went to his credit at the Motordrome in Los Angeles in 1911. Tetzlaff also holds the 25, 50, 75, 100, 150, 200 and 250-mile American speedway records, regardless of class, the first three of these having been made in the Lozier and the last four in the Fiat.

The Case is well represented. Disbrow has been a most consistent driver for several years, having won many small events, the most important of which was at Philadelphia in 1911. Disbrow has many records to his credit. Among these are the straightway free-for-all records, regardless of class, for 150, 200, 250 and 300 miles and the 1-hour race which were made in a special car at Jacksonville in 1911, and the 3, 4 and 5-mile records for the 1-mile circular dirt track, which were made in a Simplex at Cleveland. Disbrow also won four events at Jacksonville, Fla., and four more at Old Orchard, Me., in 1911.

"Bill" Endicott has been a consistent small car pilot for a number of years. His principal victories include one event at the Los Angeles Motordrome in 1911 and the Wisconsin Trophy, which he captured in Milwaukee in 1912.

Nikrent also has won several prominent victories at Bakers-

Louis Disbrow and mechanician on his chain-driven Case as they will appear in the big race at Indianapolis on Memorial Day. Note how closely the chassis is stripped to reduce weight

The Henderson contingent. Left to right, they are Harry Goetz, the team manager; Frank Jones, mechanician and relief driver; Billy Kniper, driver, and R. P. Henderson, vice-president of the Henderson Motor Car Co.

Pilette in the Mercedes-Knight car which he will drive in the coming 500-mile race at the Indianapolis Speedway. Note the V-shaped radiator and sloping hood

Harry Endicott in the Nyberg special racer which will be his mount in the big Indianapolis race. This is one of the three sixes entered in the contest

One of the three Isottas entered in the race. The drivers nominated for these cars are Harry Grant, Teddy Tetzlaff and Trucco, the latter from the factory in Italy

The three cars comprising the Case team are somewhat different in mechanical details. They are stripped very closely

field, Cal., Santa Monica, Los Angeles and at the Los Angeles Motordrome in 1911.

Aside from the American team drivers, Mulford is perhaps the most prominent among the single entries. Mulford became famous in 1910 when he won the Elgin National and Fairmount Park races and was second in an important event at Philadelphia. He added considerably to his laurels in 1911 when he won the Vanderbilt and was second in the Elgin National. His chief performance in 1912, however, was the second place which he won in the Elgin National Road Race.

Billy Knipper came into prominence when he won the Cobe trophy race at Crownpoint, Ind., in 1909 in a Chalmers car and again when he won the small-car race at Savannah in 1910.

Wilcox became prominent as pilot of a National car and has had considerable experience on the Indianapolis Speedway, particularly in the 500-mile race as he competed in both of the previous ones. In 1911 Wilcox added considerably to his laurels at the Beach Races in Jacksonville, Fla., in which he won five events, and at the Los Angeles Motordrome, where he carried off the first prize for four events. Wilcox also holds the 1 and 5-mile record in the 301 to 450 cubic inch class.

Jenkins is a well-known driver of small cars, having made consistent performances in many of the country's important events during the last 4 years. He has driven in both of the previous 500-mile races at Indianapolis and is credited with the first place in one event at Fernbank Dam, Cincinnati, O., in 1911.

If car quality is any criterion of a race meet, the Memorial Day 500-mile international race will be the most closely-fought battle of speed kings America has witnessed. In spite of the fact motors are smaller this year than formerly has been the rule at the Speedway on account of the piston displacement limitation of 450 cubic inches, it is a safe prediction that a faster pace will be set than ever before. Not alone are the cars lighter, which to an extent makes up for the difference in cylinder dimensions, but, judging from construction and design, the engines will develop more power in proportion to their cylinder volume, and more of that power will be used in turning the rear wheels. Unless indications are at fault there are going to be fewer stops for tire changes and the cars are going to run longer without halting for fresh supplies of fuel and oil.

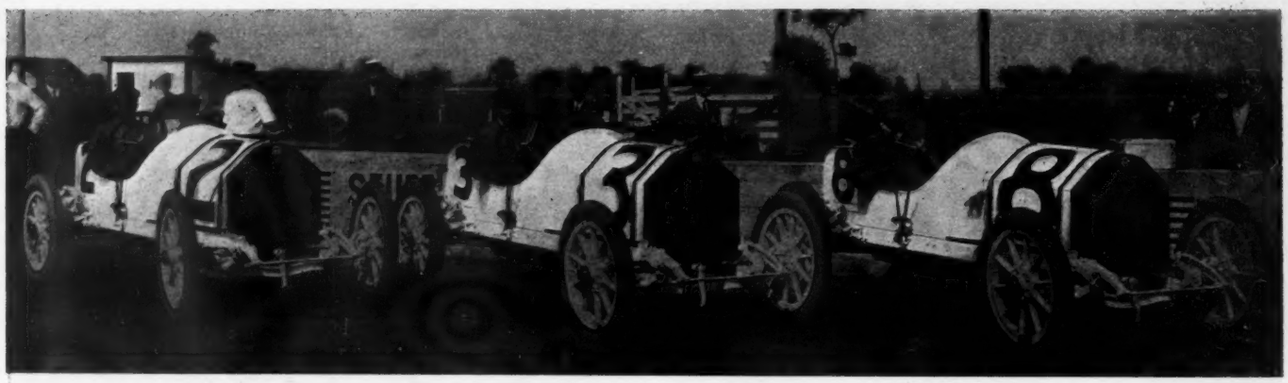
High engine speeds are the rule; such speeds as 2,800 and 2,900 revolutions per minute are common talk among the railbirds and in the racing camps. Greater attention is being paid to lessening the wind resistance; streamline bodies and small head-on area seem to be as much the ideal as great motor power. More attention has been paid to distributing the weight of the various parts of the car in such a way that skidding and bouncing over the brick track will be reduced to a minimum and thus tire wear reduced.

So far as the motors themselves are concerned, the American public will have an opportunity to see a greater variety of engine designs than ever has been offered. Not only will there be a

Specifications and Mechanical Details of Racing Cars Which Are to Compete in the

No.	Car	Driver	Mechanician	Number Cylinders	Bore, Inches	Stroke, Inches	Displacement	Cylinders Cast	Valve Location	Valve Inlet	Diameter Exhaust	Valve Inlet	Lift Exhaust
1	Nyberg	H. Endicott	James B. McNamara	6	4	5	389.0	Pairs	Left	1 7/8	1 7/8	1/4	1/4
2	Stutz	Charles Merz	Harry Martin	4	4.813	5.5	399.97	Pairs	Opposite	.....	.....	1/4	1/4
3	Stutz	G. Anderson	F. Agan	4	4.813	5.5	399.97	Pairs	Opposite	.....	.....	1/4	1/4
4	Keeton	Burman	Tony Jeanette	4	5 3/32	5.5	387.0	Pairs	Opposite	3 1/4	3 1/4	1/4	1/4
5	Mason	Evans	.....	4	5 1/16	6	350.5	Block	.....	.....	.....	.....	.....
6	Mason	Tower	.....	4	4 15/16	6	350.5	Block	.....	.....	.....	.....	.....
7	Deltal	E. H. Delting	.....	4	5 1/16	5 1/16	299.0	.....	.....	.....	.....	.....	.....
8	Stutz	Don Herr	Roy Vernon	4	4.814	5.5	399.97	Pairs	Opposite	.....	.....	1/4	1/4
9	Sunbeam	A. Guyot	R. F. L. Crossman	6	3.54	6.29	380.8	3's	Left	2 1/4	2 1/4	.512	.512
10	Henderson	Billy Knipper	Frank Jones	4	4 1/16	6	350.5	Block	Side	.....	.....	.....	.....
12	Fox	Wilcox	Frank Farber	4	4 1/2	5.5	389	Pairs	Head	2 1/4	2 1/4	5/16	5/16
15	Peugeot	Zuccarelli	Fanelli	4	4.252	7.2	448.0	Block	*Head	1.77**	1.77**	.315	.315
16	Peugeot	Goux	Begin	4	4.256	7.2	448.0	Block	*Head	1.77**	1.77**	.315	.315
17	Anel	R. C. Liesaw	W. Farr-R.C. Liesaw	4	4.5	5	318.1	Pairs	Head	1 7/8	1 7/8	5/16	5/16
18	Schacht	J. Jenkins	G. Sweetman	4	4 1/2	5.5	410.6	.....	.....	.....	2.5	.....	1/4
19	Mercer	Caleb Bragg	Roy Thatcher	4	4.80	6 5/16	424.36	Pairs	Opposite	2 3/8	2 3/8	5/16	5/16
21	Mercer	De Palma	Andy Vulman	4	4.80	6 5/16	424.36	Pairs	Opposite	2 3/8	2 3/8	5/16	5/16
22	Mercer	Wishart	J. Jenter	4	4.37	5	299.7	Pairs	Opposite	2 1/4	2 1/4	5/16	5/16
23	Mercedes-Knight	Pillette	B. Bruyere	4	3.937	5.118	251.33	Pairs	Ports	4 1/2x1 1/2	.....	.....	.....
24	Pennebaker	R. H. Pennebaker	.....	4	5.126	5.375	443.5	Pairs	Ports	.....	.....	.....	.....
25	Tulsa	Clark	Bob Moore	4	4 1/2	5.5	340.1	Pairs	Opposite	2 1/4	2 1/4	1/4	1/4
26	Isotta	Harry Grant	.....	4	4.6	6	443.86	Pairs	Head	1.97**	1.97**	.....	.....
27	Isotta	Teddy Tetzlaff	Dave Lewis	4	4.6	6	443.86	.....	.....	.....	.....	.....	.....
28	Isotta	Trucco	.....	4	4.6	6	443.86	.....	.....	.....	.....	.....	.....
29	Mercedes	Ralph Mulford	Paul Stevens	4	4.489	7.087	440.8	Pairs	Head	2 1/4	1 1/8**	.....	.....
31	Case	Louis Disbrow	Jess Callahan	4	5.1	5.5	449	Pairs	Opposite	3	3	1/4	1/4
32	Case	Nikrent	Fred Horey	6	4 1/2	5	448	Pairs	*Head	3	2 1/16	5/16	5/16
33	Case	Bill Endicott	C. R. Newhouse	4	5.11	5.5	449	Pairs	Opposite	3 1/4	3 1/4	5/16	5/16
35	Mason	Will Haupt	.....	4	4 1/16	6	350.5	Block	Side & H'd	.....	.....	.....	.....

*Nos. 15 and 16 have valves in head at angle each side. No. 35 has L head. **Double valves.



The three Stutz cars form a strong team. They are stripped as cleanly as possible to minimize weight and wind resistance

competition between the poppet-valve and the sleeve-valve designs, but among the poppet-valve designs there will be a great variety. In addition to the familiar L and T-head and the still-older valve-in-the-head constructions, there appear two valve arrangements new to the Speedway, Dusenberg's combination of horizontal valves in the side and in the head, which made its début at Elgin last year, and the diagonal arrangement of the valves in the cylinder head of the two Peugeots, which are to make their initial American appearance.

Knight-type motors appear in Pilette's Mercedes-Knight and in the Pennebaker Special. The Belgian's mount is the smallest car in the race, having a displacement of only 250 cubic inches. The sleeve valves have two inlet and two exhaust ports, each 2.125 by .5 inches. The car weighs 2,380 pounds with driver and mechanic and full tanks. Pilette relies on continuous running rather than high speed to make a showing in the race. He believes that he will be able to run the entire distance without a stop except for tires. This is on account of his exceptionally low consumption of fuel. He finds that at the speed he will endeavor to average he gets 21 miles per gallon of gasoline and the 40 gallons he carries will take him 720 miles. He believes his 10 gallons of oil will carry him the full distance. He does not attempt to account for this economy. His combination of light weight and wire wheels, together with the fact that the weight is evenly distributed over the wheels he believes will reduce tire wear to a minimum. The car has a special oil tank on the dash, feeding to the rear end. A novel feature is the use of a V-shaped wooden shield on the front axle to cut the wind. Other features are a sharp nose and a V-radiator.

A combination of old favorites appears in No. 20, Ralph Mulford driving the Mercedes. This is a chain-drive car with 108-inch wheelbase. It weighs about 2,850 pounds, the motor has valves in the head. The brake connections are cables.

Pennebaker's motor is much larger than the others, having within 7 inches of the limit in displacement. It weighs about 2,500 pounds empty and carries the same quantity of supplies as does the other. The motor weighs 812 pounds.

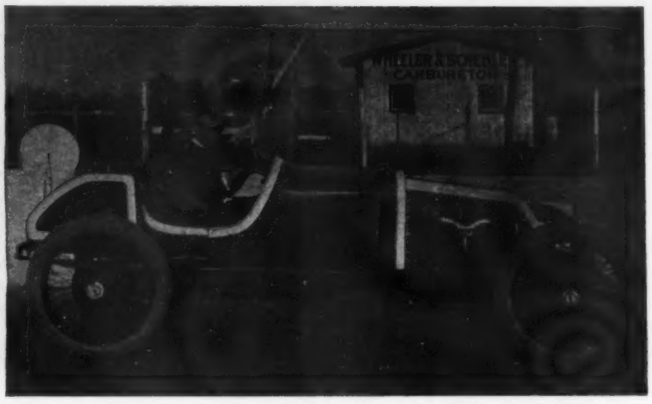
The three Isottas to be piloted by Tetzlaff, Grant and the Italian Trucco, are alike so far as motor construction is concerned. They are unique in that there are two exhaust and two inlet valves in each cylinder operated by a camshaft which is above the cylinder heads. Pistons are of pressed steel and are very light. Knipper's Henderson and the three Mason cars have the Dusenberg design of motor which did so well at Elgin and Milwaukee last year. In this the valves extend horizontally into the side of the cylinder, the push rods and rocker arms working in and out instead of up and down. These cars have both pump and thermal cooling, water being taken from the bottom of the radiator in two separate pipes, one to the radiator and the other for the thermal system. The gasoline tank used by the Masons is part of the frame to prevent the breaking of connections from vibration. The Masons have turtle backs.

Great Annual 500-Mile Sweepstakes at the Indianapolis Speedway on Memorial Day

Magneto	Number Plug	Number Distributor	Carbureter Make	Size	CONTROL		TANK CAPACITY, GALS.		Wheelbase	Final Drive	Gear Drive	TIRE SIZES		Wire Wheels	Shock Absorber
					Steer	Shift	Gas	Oil				Front	Rear		
Splitdorf	8	2	Schebler	1	Left	Center	20	6	112	Shaft	2.25	34x4	34x4	Frayer	Hartford
Bosch	8	2	Schebler	....	Right	Right	25	14	.....	Shaft	2.25	34x4.5	34x4.5	No	Hartford
Bosch	8	2	Schebler	....	Right	Right	25	14	.....	Shaft	2.25	34x4.5	34x4.5	No	Hartford
Remy	8	2	Rayfield	2½	Left	Center	32	15	108	Shaft	2	33x4.5	34x4.5	McCue	Hartford
Splitdorf	.....	.....	Schebler	....	.....	.....	30	12	106.5	Shaft	2.25	32x4	34x4.5	.....	Hartford
Splitdorf	.....	.....	Schebler	....	.....	.....	30	12	106.5	Shaft	2.25	32x4	34x4.5	.....	Hartford
.....	.....	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bosch	8	2	Schebler	....	Right	Right	25	14	.....	Shaft	2.25	34x4.5	34x4.5	No	Hartford
Bosch	4	1	Claudel	....	Right	Right	33	4	127	Shaft	.....	34x4.5	32x4.5	.....	Triou.
Bosch	8	2	Harroun	....	Left	Center	26	12	110	Shaft	.....	34x4.5	34x4.5	McCue	Hartford
Bosch	8	2	Miller	2	Right	Right	26	12	104.5	Shaft	2 or 2.17	33x4.5	36x5	No	Hartford
Bosch	4	1	Claudel	1.7	Right	Right	36	8	108	Shaft	2	35x4	34x4.5	Yes	.....
Bosch	4	1	Claudel	1.7	Right	Right	36	8	108	Shaft	2	35x4	34x4.5	Yes	.....
Remy	4	1	Unknown	1¾	Right	Right	30	15	112	Shaft	2.25	32x4	32x4	No	Hartford
Mea	4	1	Miller	....	Right	Right	30	10	110	Shaft	1.78	32x4.25	32x4.25	.....	Hartford
Bosch	8	2	Unknown	2½	Right	Right	35	18	108	Shaft	2.5	32x4	32x4	No	Hartford
Bosch	8	2	Unknown	2	Right	Right	35	18	112	Shaft	2.5	34x4.5	35x5	Rud.-Whit.	Hartford
Bosch	8	2	Rayfield	2½	Right	Right	35	18	112	Shaft	Undecided	33x4.5	34x5	Rud.-Whit.	Hartford
Bosch	8	.....	Mercedes	....	Right	Right	40	10	.....	Shaft	.....	32x4	34x4.5	Rud.-Whit.	Maybach
Bosch	4	1	Stearns	2	Right	Right	40	10	106	Chain	1.75 or 2	34x4	35x5	No	Hartford
Bosch	8	2	Rayfield	....	Right	Right	27	8	100	Shaft	2.3	34x4.5	34x4.5	McCue	Hartford
Unknown	8	2	Unknown	2½	Right	Right	30	10	105	Chain	.....	34x4.5	34x4.5	Riley	Hartford
Bosch	8	2	Master	2½	Right	Right	30	10	105	Chain	.....	34x4.5	34x4.5	Riley	.....
Unknown	8	2	Unknown	2½	Right	Right	30	10	105	Chain	.....	34x4.5	34x4.5	Riley	.....
Bosch	8	2	Rayfield	2½	Right	Right	42	10	108	Chain	1.25	34x4.5	37x5	.....	Mercedes
Unknown	8	2	Rayfield	....	Left	Center	28	12	108	Chain	2½	.....	.....	McCue	Hartford
Unknown	12	2	Unknown	....	Right	Center	32	16	106	Shaft	2½	32x4	35x5	.....	Hartford
Unknown	8	2	Rayfield	2½	.....	.....	28	12	104	Chain	2½	32x4	34x4.5	.....	Hartford
Splitdorf	.....	.....	Unknown	....	.....	.....	30	12	106.5	Shaft	2.25	32x4	34x4.5	.....	Hartford

NOTE—The equipments given are probable but may be changed.

Jules Goux on the record-making Peugeot



Bob Burman at the wheel of the Keeton entry

Showing the wind cutting lines of the speedy Sunbeam

Exhaust side of the engine on Burman's Keeton

Massive exhaust manifold of De Palma's Mercedes

The Peugeots have two camshafts on top of the cylinders driven by vertical shaft and worm from the crankshaft. The valves are in the head, but are set into the cylinder diagonally. Valves are in duplicate throughout and the seats are on the under side of the cylinder casting, so that the valves are closed when they are pushed up. Oil is forced into the cylinders at a pressure of 30 pounds per square inch. The pressure employed in most of the American racers is in the neighborhood of 2 pounds. Pistons are cut from solid blocks of steel.

The car having the most features of interest to American eyes is the English Sunbeam. The motor is one of the three sixes in the race and is of the L-head type cast in blocks of three. Though all the valves are on the left side of the cylinder, the carbureter is on the right, the inlet manifold passing between the two cylinder castings. One of the novel features is the method of cooling the oil through a series of 1.5-inch copper tubes arranged outside of the body and running from the motor to the tail. The oiling system is a circulating one under a pressure of 25 pounds per square inch. After the oil has been used in the motor it is sent through these cooling tubes before it is returned. Another evidence of thoughtfulness is the way the waste of water from a steaming radiator is prevented. Instead of allowing the steam to shoot out the overflow pipe, the latter is attached to a coil of small copper tubing in the form of a spiral which acts as a condenser, returning the evaporation in the form of water to the radiator. Pistons are bored from a solid steel block and are very light.

The three Mercedes to be driven by De Palma, Bragg and Wishart have very much the same features that characterized this car last year. The motor is of the T-head type cast in pairs. The transverse shaft in front of the motor and carrying the pump and magneto is a feature still, but the chain timing-gear drive is supplanted by a spur gear with skewed teeth. The pistons are cast steel.

Disbrow and Nikrent's two four-cylinder Cases are similar in size and make-up. This involves a T-head motor cast in pairs and a double chain drive. There is a difference in wheelbase, Nikrent's being 4 inches longer than Disbrow's. The six-cylinder Case which Endicott is to pilot is an L-head motor with valves in the head. Two sets of exhaust valves are used. This car has shaft drive. Both Nikrent and Endicott have their balance well worked out so far as weight distribution between front and rear wheels is concerned. The four weighs only 150 pounds more in the rear than in the front, while there is only 40 pounds difference between front and rear on the six. Steel forged pistons are used on all three Cases.

Nyberg One of the Sixes

Harry Endicott's Nyberg is the other of the three six-cylinder cars entered in the race. The car has an L-head motor cast in pairs. The valves are comparatively small, being 1.875 inches in diameter and .375-inch lift. Endicott has gone in for reducing wind resistance, giving the body a streamline effect by a sharp

nose and tail and a flaring shield in front of the steering wheel. The nose has fins in front of the radiator to direct the air upon it.

Burman's Keeton is one of the spectacular cars in looks as well as speed. The oddity in looks is due to the radiator location back of the motor. The motor is covered with the sloping European type of hood, which is simply a screen. The engine has T-head cylinders cast in pairs. Burman has a special brace for the steering column, illustrated in one of the sketches on this page. A vertical rod is bolted to the side frame member and attached to the column by a T. Another brace of strap steel runs from that point to the transmission. It is curved and carries the shaft of the speedometer.

The three Stutzes driven by Merz, Anderson and Herr are alike in every respect so far as can be told from the outside appearance. The motors at least are the same size, 4.814 by 5.5 inches. The Stutz company does not care to have all the details published at this time. It may be stated, however, that the motors are T-head, cast in pairs. The cars can carry 25 gallons of gasoline and 14 gallons of oil. The gear ratio is 2.25-1. There has been little attention paid to getting streamline body effects.

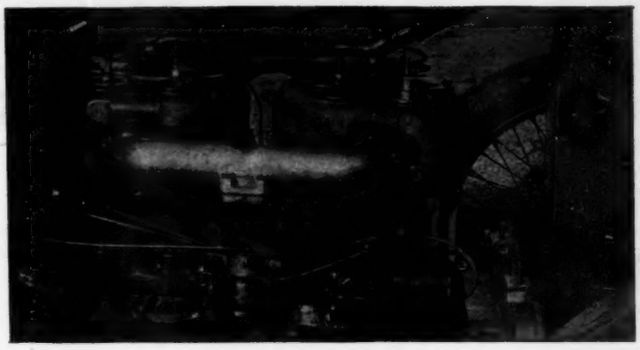
Novel Features in Fox

Wilcox's mount, the Fox Special, was built by Frank Fox, of Indianapolis, and has some novel features. The motor is a valve-in-the-head design made with 2.25-inch valves made of chrome vanadium steel lifting 9-16 inch. Empty there is 16 pounds more weight over the front wheels than over the rear, but with load the rear wheels carry 240 pounds more than the front. The wheelbase is 104.5 inches. Special pains have been taken in the balance, but Fox relies more on his own special spring suspension to prevent tire wear.

Liesaw's Anel gets its cognomen from the name Lena spelled backwards. It has a familiar type of valve-in-the-head motor with the spark-plugs stuck in the side. This car is unique in two respects. So far as known at this time it is the only one that will attempt the race without differential action and the only one not having an aluminum crankcase. Liesaw finds the bronze crankcase holds up better. There is no exhaust manifold, the exhaust being led from each cylinder directly through the hood to the air. The steering column is supported in a manner similar to Burman's, and illustrated herewith.

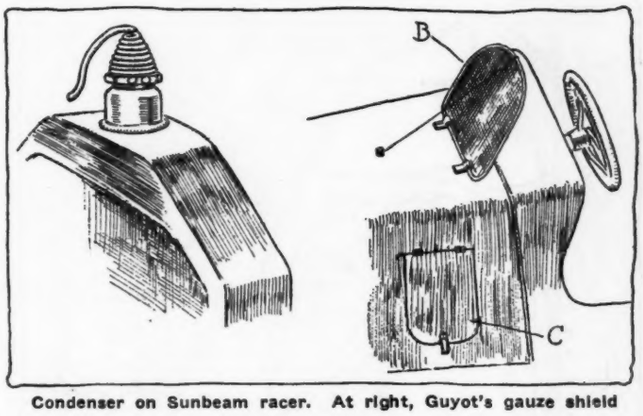
The Schacht which Jenkins is to pilot is the only car which has appeared so far with the sheet metal guards on the wheels which were so common last year during the tryouts.

Clark's Tulsa is an Oklahoma entry and takes the name of its home city. It has a T-head motor with the cylinders cast in pairs. The car weighs 2150 empty and has wire wheels.

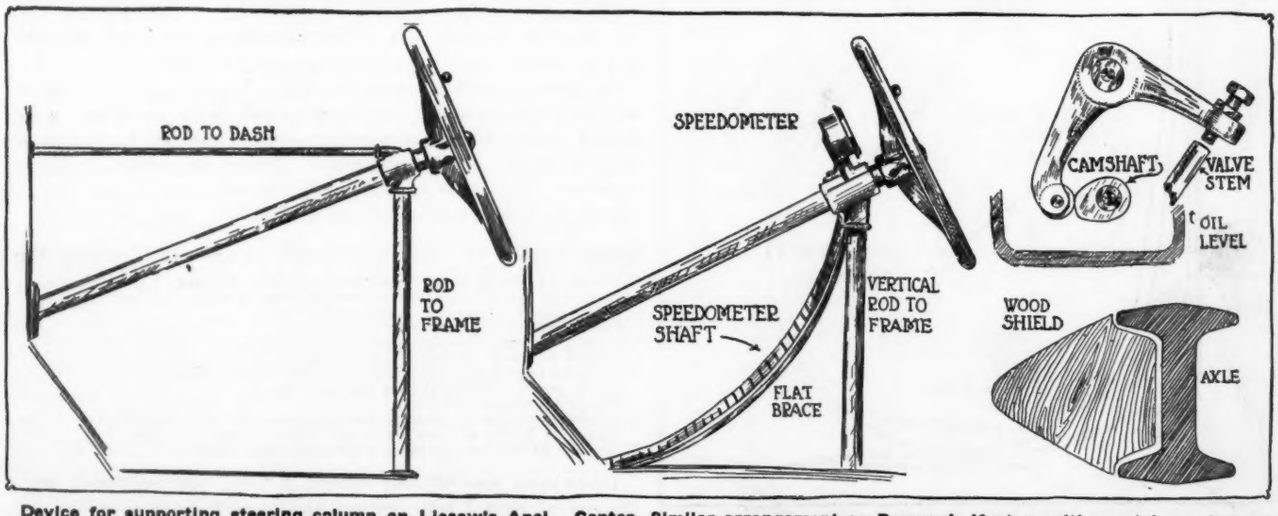


Intake side of the Tulsa motor. Note the absence of fan

View of the Sunbeam motor, showing condenser on radiator



Condenser on Sunbeam racer. At right, Guyot's gauze shield



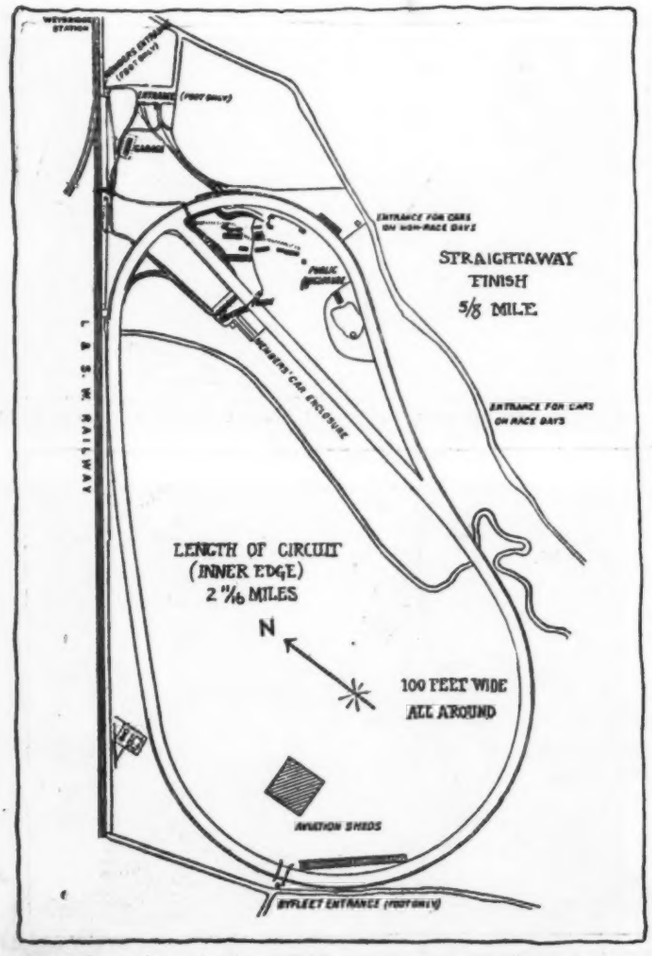
Device for supporting steering column on Liesaw's Anel. Center, Similar arrangement on Burman's Keeton, with special speedometer mounting. At right, upper sketch is valve mechanism on the Isottas, while lower shows wooden shield on front axle of Pilette's Mercedes to cut down wind resistance

Brooklands Is World's Fastest Speedway

THE Brooklands motor course, which is situated at the Weybridge Station of the London & Southwestern Railway, in England, is the fastest speedway in the world, its superiority over the Indianapolis Speedway from a speed-producing standpoint being obtained by means of the design and construction of the course as regards the greater radius of its curves and its more efficient banking. The track surface is of concrete laid to a depth of from 6 to 8 inches.

The Brooklands Speedway was constructed during 1906 and the spring of 1907 by H. F. Locke King, the owner both of the track and of the property on which it stands. It is the first of the really great speedways designed particularly for automobile competition, and the aim for constructing the track was not only to give English manufacturers an opportunity of competing in motor races on equal terms with their rivals on the Continent, but also to provide a testing ground whereon the efficiency as well as the speed of cars could be improved.

Until the Brooklands track was opened Continental European manufacturers had an enormous advantage over their English rivals, owing to the fact that important road races were held yearly on the Continent and nothing of a similar nature was possible in England. Now all this is changed. Brooklands track is always available, whereas Continental motor races can only be held once, or at most, twice a year. The advantages which English manufacturers have gained thereby have been so marked that projects for the construction of similar tracks are on foot both in France and Germany.



Plan view of the grounds at Brooklands track

The Brooklands track is somewhat of the shape of a pear; the complete circuit is 2 miles 1,350 yards. Across one corner is an internal portion of the course known as the straight which leads from the circuit of the track to the finishing lines and official buildings, the latter being situated on a space known as the paddock. Between the straight and the northeastern corner of the track are the inclosures, which, being on a natural hill, enable the spectators to obtain a magnificent view of the track. In these inclosures are erected covered stands for viewing the races, in addition to lunch rooms, refreshment rooms, cloak rooms, etc., all of which are capable of accommodating a very large number of spectators.

As for the curves of the Brooklands track, there are only two when the Straight is avoided, both of which are of a greater radius than those of the Indianapolis Speedway. The sharpest curve on the northern end being struck at a radius of 1,000 feet, while the mean radius of the longer curve is 1,550 feet. This is one of the chief reasons why the Brooklands track is faster than the Indianapolis Speedway, which really has four curves having a radius of 840 feet. The curves of this track have been scientifically banked so that even at speeds of 100 miles an hour a car driven at the proper height on the banking has all four wheels pressing equally on the track and there is no tendency to skid. One circuit of the track on the center line gives a distance of 2 miles 1,350 yards. One circuit at 10 feet from the inner edge gives a distance of 2 miles 1,263 yards. The width of the track is 100 feet. The length of the level Finishing Straight is 991 yards and the maximum height of banking on shorter curve is 28 feet 8 inches.

Track Measured for Testing Work

To enable manufacturers to carry out careful tests of their cars the track has been most accurately measured and various points marked thereon, so that with the assistance of any of the staff manufacturers can, if they wish, take accurate note of the distance traversed and for their own purposes ascertain the speeds of their cars, fuel consumption and any other details they wish to observe. A special test hill has also been constructed on accurate gradient; and with the combination of the track and the hill practically every detail of a motor car can be carefully worked out. The average gradient of the test hill is nearly 1 in 5 whilst the maximum gradient is 1 in 4.

In addition to the scientific work which goes on at Brooklands and the regular testing, the sporting side is by no means overlooked and regular race meetings held at the track are now a feature in the sporting calendar. During 1913 five large race meetings will be held in addition to numerous small ones inaugurated by county motor and cycle clubs.

Specifications of the Brooklands Speedway Construction

Length of circuit once round with finishing straight, 3.25 miles.
Length of circuit once round with finishing straight, 3.25 miles.
Mean radius of shorter curve, 1,000 feet.
Mean radius of longer curve, 1,550 feet.
Length of level finishing straight, .625 mile.
Length of level in one circuit, 2 miles.
Up gradient of the approach to shorter curve, 1 in 30.
Down gradient from shorter curve, 1 in 25.
Width of course, 100 feet.
Maximum height of bank on shorter curve, 28 feet 8 inches.
Maximum height of bank on longer curve, 2 feet 10 inches.
Number of bays or stopping places for cars, seven.

Brooklands was officially opened in June, 1907, and until near the end of 1909 it was devoted almost exclusively to motor car and motorcycle tests and competitions.

Indianapolis Speedway as 500-Mile Course

THE Indianapolis Speedway was constructed in the spring of 1909 by the Indianapolis Speedway Co., headed by C. G. Fisher, A. C. Newby, F. H. Wheeler and J. A. Allison and with P. J. Andrews of New York as construction engineer. The first races upon it were run in August of that year, while the track was still in a rather incomplete condition. As a result of the premature opening, however, several regrettable accidents occurred and fault was found with the surface of the track. Immediately after the races, therefore, the original taroid macadam surface was covered with vitrified brick, and these improvements were completed for a meet held in the fall of the same year.

The course of the Indianapolis Speedway is 2.5 miles long, 50 feet wide on the straight stretches, 60 feet wide on the curves, and is located on a plot of ground 1.5 miles long, .5 mile wide, containing 320 acres. The straight stretches are 3,301 feet long, while the ends are 660 feet long. The curves are each a quarter of a circle of 840 feet radius on the course line or 90 degrees of a 6 degree 49 foot 30-inch curve, no easement curves or spirals being used. The curves are banked to an angle of 16 degrees, 40 inches in cross-section for 50 feet of their width, the remaining 10 feet of width being banked to an angle of 36 degrees, 40 inches.

The approaches and releases to and from the bank curves are limited to a 2 per cent. grade in sections parallel with the measured course line and the maximum variation from a level plane at the course line is a 2 per cent. grade. The straight stretches are given a pitch of .8 inch in 50 feet toward the infield for drainage, thus presenting a fine flat track. In constructing this speedway, after being properly graded the whole course was resurfaced and rolled with a 15-ton three-wheel steam roller until the surface presented a smooth, firm and uniform plane. Two inches of thick gravel was then spread uniformly over the entire surface and rolled with a 15-ton roller. This was followed by a 2-inch layer of crushed limestone rolled with an 8-ton tandem roller, over which was poured 2 gallons of taroid to the square yard. This surface was then overcast with ½-inch crushed stone chips filling the voids between the larger size stone and given another coat of taroid of a lower melting point than the first part. Over this was spread a thick layer of crushed stone from .5 inch to dust in size and given a final rolling with a 3-ton tandem steam roller.

3,200,000 Paving Bricks Required

This surface, which presented the original idea, did not prove to be satisfactory, and the idea of paving over this surface with brick was evolved and carried out. In preceding with the brick paving it was decided to accept the specifications of the National Paving Brick Manufacturers' Association, and 3,200,000 pressed paving bricks were ordered for the purpose.

Two reinforced concrete bridges were built to support the track over a stream running diagonally across the southwest corner of the grounds. These bridges are 30 feet wide and 90 feet long and of a permanent character.

The main grandstand, a commodious covered structure, seats approximately 10,000. Ranging around the south turn are thirteen miniature grandstands intended for private parties, each of which will hold twenty-eight people. Then in about the middle of the south turn is another big stand, the bleachers, which will hold 4,200 more. The main grandstand is 82 feet wide and 500 feet long and there are two bleachers, one 500 by 60 feet and the other one 350 by 65 feet.

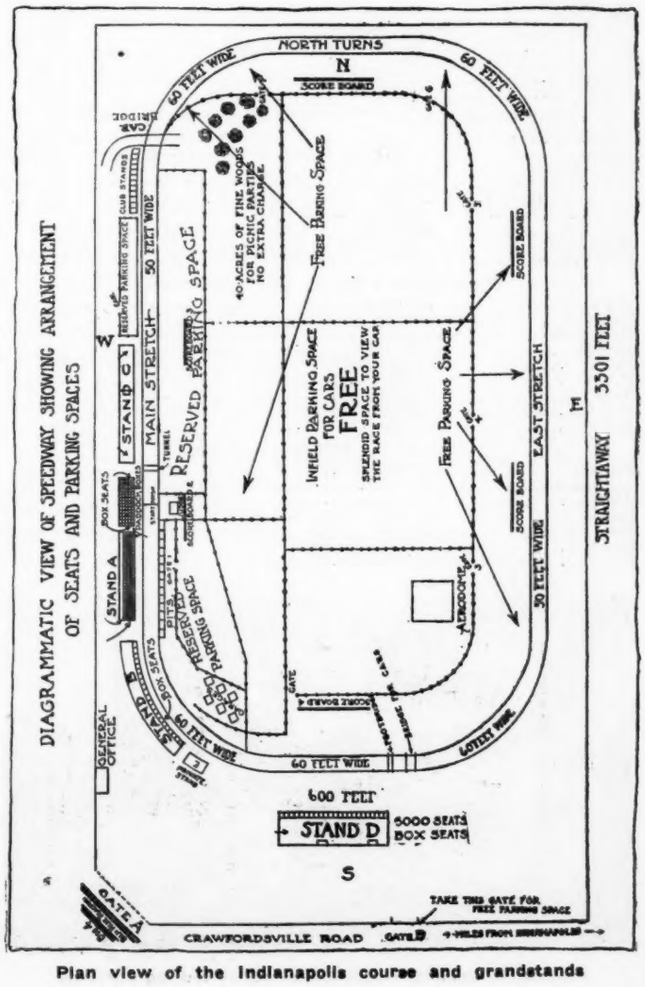
Three miles of tight board fence 8 feet high, surmounted with barb wire surrounds the grounds, the posts being set in concrete. There are 7 miles of wire fence in the infield and around the track and 1.5 miles of 8-foot picket fence, two suspension bridges for foot traffic cross the track, giving egress from the infield during the races. A truss bridge for vehicles also is provided which affords entrance and exit to and from the infield.

Piston Displacement and Speed of First Ten Cars in 500-Mile Race for 1911

Car.	1911	No. Cyl.	Bore	Stroke	Piston Distance	Time h.m.s.	Time m.p.h.
Marmon	Harroun	6	4½	5	477	6.42.08	74.8
Lozier	Mulford	4	5⅜	6	544	6.43.51	74.28
Fiat	Brown	4	5	7½	589	6.52.29	72.7
Mercedes	Wishart	4	5.1	7.1	583	6.52.57	72.6
Marmon	Dawson	4	4¼	7	495	6.54.34	72.3
Simplex	DePalma	4	5¾	5¾	597	7.02.02	71.0
National	Merz	4	5	5 11/16	477	7.06.20	70.3
Amplex	Turner	4	5 5/16	5	443	7.15.56	68.9
Knox	Belcher	6	5	4¾	559	7.19.09	68.3
Jackson	Cobe	6	5	5½	432	7.21.50	67.9

Piston Displacement and Speed of First Ten Cars in 500-Mile Race for 1912

Car	1912	No. Cyl.	Bore	Stroke	Piston Distance	Time h.m.s.	Time m.p.h.
National	Dawson	4	5	6¼	490.8	6.21.06	78.7
Fiat	Tetzlaff	4	5	7½	589	6.31.29	76.6
Mercer	Hughes	4	4⅜	5	300	6.33.09	76.3
Stutz	Merz	4	4¾	5½	389.9	6.34.40	76.0
Schacht	Endicott	4	4¾	5½	389.9	6.46.28	73.3
Stutz	Zengel	4	4¾	5½	389.9	6.50.28	73.0
White	Jenkins	6	4½	5¾	489	6.52.38	72.7
Lozier	Horan	4	5⅜	6	549	6.59.38	71.4
National	Wilcox	4	5	7½	589	7.11.30	69.6
Knox	Mulford	6	4.8	5½	597	8.53.00	56.2



Plan view of the Indianapolis course and grandstands

Boillot, in Peugeot, Star at Le Mans

Covers 5 Kilometers in 1 Minute 56 2/5 Seconds—Average Speed 96 Miles per Hour—Two Americans Entered in Meet

PARIS, May 14—Georges Boillot, piloting the racing Peugeot with which Goux set up world's records at Brooklands recently, was the star performer at the Le Mans Whitsuntide meeting. The 5 kilometers straightaway was covered in 1 minute 56 2/5 seconds, being at the rate of 96 miles an hour. No other car came anywhere near the Peugeot's time. In the kilometer hill climb, with a flying start, over an average gradient of 5 per cent, Boillot's time was 35 2/5 seconds, being at the rate of 62.8 miles an hour. America was represented in this meeting by two Buicks, one running as a racer, the other as a touring car. In the racing section the Buick was fastest in its class, putting up 2:58 2/5 for the 5 kilometers (3.1 miles) and 48 seconds for the kilometer hill climb. The touring Buick, driven by Repusseau, showed 3:26 for the 5 kilometers and 56 seconds for the kilometer hill climb. The best time made in the touring sections, irrespective of size, was 2:36 1/5 for the 5 kilometers and 44 4/5 for the hill climb. These times were made by a new model Rolland-Pilain carrying six passengers. For the kilometer an Isotta-Fraschini tied with the Rolland.

5 kilometers—3.1 miles—Racers

Car	Driver	Time
Peugeot	Boillot	1:56 2/5
Anasagasti	Brown	3:21
Crespelle	Crespelle	2:29
Buick	Pouget	2:58 2/5
Vermorel	Gaste	3:26 2/5
Bugatti	Dillon-Kavanagh	3:23
Bugatti	Frederich	2:58

5 kilometers—3.1 miles—Touring Cars Driven by Amateurs

Isotta-Fraschini	Comte de Toulouse-Lautrec	2:43
Pilain	Comte de Peyronnet	3:40 3/5
Th. Schneider	Louvet	3:31
Panhard-Knight	Mitsche	5:29 4/5
Rolland-Pilain	Pouzet	4:05 3/5
Pilain	Colliere	4:36
Buchet	Durand	5:27
Bugatti	Desrochers	4:26
Baby Peugeot	Grillet	4:29 4/5

Touring Cars Driven by Professionals

Rolland-Pilain	Pierron	2:36 1/5
Vauxhall	Roper	3:22 4/5
Hispano-Suiza	Garas	3:07 1/5
Pierron	D'Avary	2:23 2/5
Buick	Repusseau	3:26
F.A.B.	Lafon	4:28 1/5
Scap	Launay	3:52 1/5
Bugatti	Dillon-Kavanagh	3:38
Bugatti	Frederich	3:17

1-Kilometer Hill-Climb, Racers

Peugeot	Boillot	0:35 2/5
Anasagasti	Brown	0:55 2/5
Alcyon	Barriaux	0:41 4/5
Buick	Pouget	0:48
Scap	Mollet	0:56 4/5
Bugatti	Dillon-Kavanagh	0:56 3/5
Bugatti	Frederich	0:47 2/5

1-Kilometer Hill-Climb, Touring Cars, Amateurs

Car	Driver	Time
Isotta-Fraschini	Comte Toulouse-Lautrec	0:44 4/5
Pilain	Comte de Peyronnet	1:00 4/5
Scar	Lambert	1:02 1/5
Th. Schneider	Louvet	0:59 3/5
Panhard-Knight	Mitsche	1:43 3/5
Rolland-Pilain	Pouzet	1:10 4/5
La Ponette	Gilles	1:08
Bugatti	Desrochers	1:04
Baby Peugeot	Grilliat	1:23 4/5

1-Kilometer Hill-Climb, Touring Cars, Professionals

Rolland-Pilain		0:44 4/5
Aries		1:00 2/5
Hispano-Suiza	Garas	0:51 4/5
Pierron	D'Avary	0:52
Buick	Repusseau	0:56
F.A.B.	Lafon	1:17
Scap	Launay	1:07 1/5
Bugatti	Dillon-Kavanagh	0:53 3/5
Bugatti	Frederich	0:52 3/5

Grand Rapids Run Sanctioned

GRAND RAPIDS, MICH., May 24—Official sanction No. 577 has been allotted by the contest board of the A. A. A. for the second annual reliability run for Grand Rapids automobile dealers and private owners, promoted by The Grand Rapids *Herald* and given under the auspices of the Grand Rapids Automobile Club.

The tour will occupy the dates of July 21 to July 25, inclusive. The route will be the central highway to Mackinaw, returning via the Lake Michigan coast semi-boulevard trail. Each day's drive will be a hammering run, early into night controls, each of which will be in some one of Michigan's famous resort cities, with a whole afternoon and evening at historic Mackinaw. The only portion of the route to be twice traversed will be the main street in Petoskey.

Wolseley Wins Canadian Climb

HAMILTON, ONT., May 24—*Special Telegram*—The first hill-climbing contest ever held in Canada took place on Saturday, Dominion Day. It was won by A. Sharp, of Toronto, in a Wolseley car in 2 minutes and 42 seconds. Other cars of 35 horsepower and over scoring victories included the Hudson, Stearns, Overland and Russell.

Plan 6 Day Tour into Virginia

PHILADELPHIA, PA., May 24—Starting next Thursday morning, the Automobile Club of Delaware County will conduct a 6-day tour of Virginia. The start will be made from Newtown Square and participants will be picked up *en route* through Paoli and

Pierron, in Rolland-Pilain, made fastest touring car time

Georges Boillot making 95 miles an hour in his Peugeot

Baby Peugeot car which took part in Le Mans meet

Buick car on a straightaway in the Le Mans meeting

Downingtown, with a noon stop at Lancaster, Gettysburg being the objective point for the first day. Various points of interest in Virginia will be visited on the second, third and fourth days, the return trip being scheduled to start on Monday.

—

Sixteen Cars for Indiana-Pacific

INDIANAPOLIS, IND., May 24—The participants of the Indiana-Pacific tour which will last 33 days and cover 3,549.1 miles, will travel through eight states, following the route shown on the map herewith. Starting from Indianapolis on July 1, they will pass through St. Louis, Kansas City, Colorado Springs, Denver, Salt Lake City, Goldfield, Sacramento and San Francisco, to arrive in Los Angeles on August 2. There will be no path-finding tour, but an official pilot will travel in advance of the tourists, marking the trail. So far sixteen entries have been received.

—

INDIANAPOLIS, IND., May 26—The Indiana Automobile Manufacturers' Association has received two entries from Apperson Brothers, Kokomo, for the Indiana-to-the-Pacific tour, which starts from Indianapolis on July 1. Elmer and Edgar Apperson have announced they will alternate driving one of the Apperson entries. The total number of entries for the tour is now eighteen. The route of the tour has been announced and is shown on the accompanying map.

—

NEW YORK CITY, May 26—The L. I. A. C. will hold, on May 30, a run from its home in Brooklyn to the Edgewood Inn, Greenwich, Conn., which must be done in a specified time. Penalization will be for lateness, and the least penalty in combination with a secret mileage over which the trip is to be made will decide the winner of the Frank H. Newcomb trophy. Every contestant will have a chance of deciding whether he will make the trip over a short road slowly, or quickly over a long one.

—

WASHINGTON, D. C., May 26—The newly organized Washington Motorists' Association will give its first run Memorial Day, to Hagerstown, Md. The event is to be a free-for-all affair, with no rules or restrictions, and it is expected at least 100 members of the association will take part.

—

$2,500,000 Cement for Transcontinental

INDIANAPOLIS, IND., May 26—The Ocean-to-Ocean Highway movement, projected by Carl G. Fisher and James A. Allison, has received a material boost by the offer of the Association of American Portland Cement Manufacturers to furnish cement valued at approximately $2,500,000 for the road. The offer is conditioned on the road being of concrete construction.

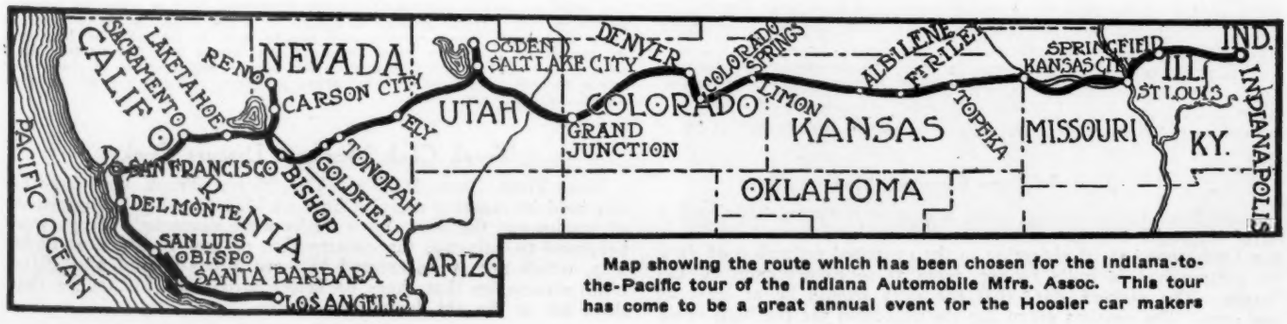
This brings the total subscriptions to the movement up to about $5,000,000, or approximately half of the $10,000,000 the promoters have undertaken to raise for the purchase of material. It is believed the offer will bring renewed interest in the project.

—

France to Allow $6,800,000 for Roads

PARIS, FRANCE, May 14.—Probably a credit of $6,800,000 will be allowed this year for the upkeep of the 38,337 kilometers of national highway existing in France. This will represent an increase of $400,000, compared with a year ago, and will be an allowance of $243.6 per mile per annum for maintenance only. For 1914 it is proposed to grant the sum of $7,200,000 for the national highways, this being at the rate of $302.25 per mile per annum. These figures deal only with the national highways of France, which have a total length of 23,831 miles, and are entirely under the control of the central government. The three other classes of roads, which are more or less under local control, have a mileage of 339,867, giving a total for all classes of made roads in France of 363,698 miles.

Recent events have shown that the credit for the upkeep of French national highways is insufficient, not having kept pace with the increase of traffic and particularly automobile traffic. Even the progressive increases made since 1910 are hardly sufficient to cover the increasing wear and tear. A proposal is now before Parliament to make a special allowance of $1,600,000 for the reconstruction of roads in most urgent need of repair. With a grant of this proportion and the projected increase for maintenance expenses the roads can be got back to their original perfect condition.



Map showing the route which has been chosen for the Indiana-to-the-Pacific tour of the Indiana Automobile Mfrs. Assoc. This tour has come to be a great annual event for the Hoosier car makers

Members of the American Society of Automobile Engineers and of the English Institute of Automobile Engineers just before setting out from the steamship pier for the Hotel McAlpin

S. A. E. Enthusiastically Greets English Engineers

Members of American Automobile Engineering Society at Pier To Meet British Delegation—Many Social Activities

NEW YORK CITY, May 27—The party of twenty-five English automobile engineers arrived here yesterday at 6:30 p. m. and were met by a large gathering of members of the Society of Automobile Engineers who had gathered in this city to greet their British guests. Three rousing cheers hailed the party as they made their way down the gangplank and the waiting automobiles whirled them to their quarters at the McAlpin Hotel.

After a rest of about an hour the male members of the party were conducted to Healy's restaurant, where a beefsteak dinner awaited them in the Jungle Room. Here the members of the party were initiated into the intricacies of the American beefsteak dinner which had been discussed frequently during the voyage. It is even stated that the members of the party persuaded the captain to closely approach the record day's passage of the Minnewaska in order to get the party to New York in time for the affair. At the conclusion of the dinner speeches of welcome were made by Toastmaster Anglada, President Marmon, P. D. Wagner, H. M. Lloyd and C. W. Spicer, the members of the New York committee and the general committee to which Messrs. Brown, Joy, Clarkson and Wheeler responded with an expression of appreciation for their hearty welcome.

The party assembled again at the McAlpin Hotel at 8:30 this morning and in spite of a drizzling rain and raw wind enjoyed an automobile trip around the city. During the forenoon the Woolworth Building was visited as well as the Battery, Brooklyn, the East River bridges, the Aquarium and the service plants in Long Island City. At the conclusion of the morning's run the party assembled at the Automobile Club of America where a buffet luncheon was served. Owing to the bad weather the baseball game had to be omitted from the program and trips to local points of interest were made instead. The New York City Fire Department has promised a drill to exhibit the working of the Metropolitan apparatus.

The program calls for a stay in New York until 9:25 tomorrow morning when the party will board the train for Pittsburgh. Two special cars have been set aside for their use and these will be sidetracked during the stay at Pittsburgh and Indianapolis.

Tire Makers Oppose Tariff

NEW YORK CITY, May 24—The tire manufacturers have filed a brief with the Senate committee under whose consideration is the Underwood tariff objecting to the proposed reduction of duty on guttapercha or india rubber, from 35 to 10 per cent. ad valorem. The makers state that the duty should be at least 25 per cent. The reasons given for the objection are the high labor cost in this country and the unconditional competition among the tire makers. It is also stated that if the reduction goes through the Goodrich company, having a factory in France, would be able to produce enormous quantities of tires for the American market, paying for cheaper labor in France; so that it would be possible for this company by the use of its French factory to "beat the Akron manufacturers off the face of the earth," according to the language of the protest.

Electric Men Object to Truck Fee Raise

BOSTON, MASS., May 24—The New England section of the Electric Vehicle Association of America, the Electric Motor Car Club of Boston and the Electric Light Companies of Massachusetts held a joint meeting here on May 20 and 21 at which the general and local problems facing the electric-car maker, dealer and user were taken up. The attendance was large, and besides listening to a series of papers, the visitors held an outing at Relay House, Bass Point, Nahant, situated on the north shore of Massachusetts Bay. The plant of the General Electric Co., West Lynn, was visited.

The following resolution was passed by the members of the three bodies present at the meeting:

RESOLVED: That the passage of any bill arbitrarily increasing the registration fees on motor trucks would be injurious to the industry as a whole, would tend to retard the industrial development of natural resources and the manufacturing growth of this state, and would seriously restrict commercial progress. Such action would be contrary to the traditional spirit of progress which has always distinguished this commonwealth and its great and general court;

RESOLVED: That such a discriminating tax would be an unfair burden upon a growing industry which is assisting to promote commerce and improve fundamental conditions in the commonwealth's industrial life;

RESOLVED: Should it be found necessary to secure additional funds for building and preserving the state highways, that a scientific investigation of actual traffic conditions should be made, which we believe would show that horse-drawn wagons and trucks tend to destroy the highways by reason of the sharp steel shoes of the horses and the narrow steel tires to a much greater degree than the broad yielding tires of the motor truck and that fees should be proportionately charged on all vehicles using the highways.

Truck Club Members Discuss Docks

NEW YORK CITY, May 26—The Motor Truck Club of this city held its monthly meeting here on May 21, when the questions of trucks and the New York docks were discussed. Steps were proposed to influence the construction of new docks, now under way, which are to be erected between Forty-second and Fifty-ninth streets, so that there be better provisions for trucks than there are at the old docks now in use.

Majority Vote To Settle Accessory Show

M. & A. M. May Hold Separate Exhibition

NEW YORK CITY, May 27—The question whether the interest of the members of the Motor and Accessory Manufacturers would be best preserved by participating in the 1914 show at Grand Central Palace or by conducting a distinct and separate show at the Madison Square Garden—an option for which has been taken by the M. and A. M.—busied the members present at today's meeting of the board of directors. If the majority of members, among whom a vote is now being arranged, are in favor of a separate show in the Garden, the latter will be held at the same time with the Palace show of the Automobile Chamber of Commerce. In case of a separate show manufacturers of motorcycles and parts of the same will be offered a chance to share in the Garden show. However, no matter what may be the vote of the majority of the members, and the consequent decision upon the course to be taken, the situation in Chicago will remain as before, so far as can be seen now, the M. and A. M. expecting to participate in the show to be held in the Coliseum, Annex and Third Regiment Armory.

This is by far the most important question now faced by the members of the M. and A. M. The body includes now a number of new members who became such since the 1913 show, after which William S. Sweet, general manager, made a trip to the West.

Light and Heating Strike Over

NIAGARA FALLS, N. Y., May 27—The strike in the plant here of the United States Light & Heating Co., which started on March 2, was settled last Friday afternoon, and yesterday morn- the 1,700 strikers returned to their places in the North End concern. The settlement was reached when Superintendent Engel of the plant agreed to reinstate all men who had been discharged because they were affiliated with labor organizations and those who voluntarily went on strike three weeks ago. Before the strike the company offered its employees a 9-hour day with 10 hours pay or a 10 per cent. increase in wages for a 10-hour work day. The men decided to return to work with a 9-hour day with the same wages they formerly received for 10 hours. No new men will be employed until all the strikers have been reinstated.

Germans Buy 300 Cars in 8 Months

BERLIN, May 16—During the 8 months ending with May 1, 1913, there were 300 American cars, worth $280,000, sold in Germany. During the corresponding period a year ago only eighty-nine cars which, however, aggregated a considerably higher value were disposed of in the empire. Similar advances of the American trade are reported from other Continental countries and Great Britain, which during the year ended with April imported 2,000 cars more than during the preceding 12 months.

Bennett General Manager for Willys

TOLEDO, O., May 24—John North Willys, president of the Willys-Overland Co., the Garford Co., the Gramm Motor Truck Co. and a number of other concerns, has announced the appointment of George W. Bennett, vice-president of the concerns named, as their general manager.

This step of John N. Willys shows the great confidence he has in Mr. Bennett as well as the appreciation of the latter's work in the past. Indications are that Mr. Bennett will now have a larger hand in the affairs of the company than ever before.

Before affiliating with the Overland interests, Mr. Bennett had been on the sales organizations of the White and Rambler concerns.

Treasury's Drawback Allowances to Makers

WASHINGTON, D. C., May 25—The customs division of the treasury department has been busy during the past week issuing drawback regulations to motor car companies. One prescribes that drawback of duties shall be allowed under section 25 of the tariff act of August 5, 1909, on motor cars designated as model T, manufactured by the Ford Motor Co., of Detroit, with the use of imported aluminum and Scandinavian brake lining. The drawback allowance is not to exceed the quantities of imported materials appearing in the exported cars, as shown by the maker's sworn statement, filed with the collector of customs at Detroit.

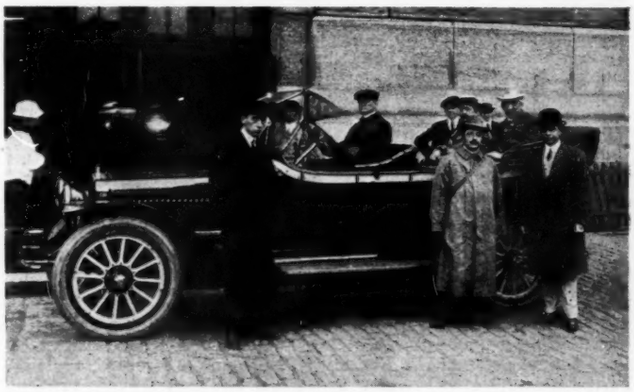
A similar regulation has been issued allowing drawbacks to the Abbott Motor Car Co., of Detroit, on motor cars and motor car real axles manufactured by that company with the use of imported ball bearings. The regulations stipulate that the allowance shall not exceed the number of imported ball bearings appearing in the exported cars or axles as shown by the manufacturers' sworn statement, also filed with the collector of customs at Detroit.

Drawback allowances will also be given the Stegeman Motor Car Co., of Milwaukee, on exportations of motor trucks manufactured by that company with the use of imported magnetos and ball bearings.

The American Ever Ready Co. is to receive drawback allowances on exportations of Ever Ready ignition batteries.

Chicago Subway Garage Held Up

CHICAGO, ILL., May *27—Special Telegram*—At the meeting of the Chicago South Park Board held last week the commissioners rejected the plans for the proposed subway garage under Grant Park, on the ground that such a structure was not feasible. What action Mayor Harrison, who is sponsor for the underground garage plan, will now take is not known, although it is reported that he will request a reconsideration. Unless the park commissioners adopt the plan, it will have to be abandoned, as they alone have jurisdiction over Grant Park, which is the property of the state and not of the municipality.



A group of S. A. E. and I. A. E. members leaving the pier

Beefsteak Dinner at Healy's, where S. A. E. and I. A. E. made merry Monday evening

Nearly four-score representatives of the electric-vehicle industry and trade met at Boston last week to discuss the

Cannot Fix Retail Price

Federal Supreme Court Deems the Payment of Maker's Price Enough Protection

WASHINGTON, D. C., May 26—*Special Telegram*—One of the most important patent decisions handed down by the United States Supreme Court in many years was rendered today in the case of Bauer Chemical Co. and others against James O'Donnell, a druggist of this city. While the case primarily relates to a proprietary medical preparation, it affects many patent owners, including those in the motor-car-supply trade. Justice Day delivered the court's decision, which was decided by a five to four vote.

"Is this an attempt to restrict prices within the statutory patent right to vend?" the court said was the principal question. "To vend means to sell, of course. The difference between the copyright and patent right is that the latter gives the right to use patented articles. The thing really gives the right to use patented articles. The thing really done here is to sell, not to use, this article. When an article is sold to a jobber, the manufacturer receives his price and all the protection and immunity of the patent law to which he is entitled. He cannot further restrict the retail price at which it is to be sold to the public.

"The case is brought within that line of cases in which this court from the beginning has held that a patentee has parted with a patented machine by passing title to a purchaser."

Oldfield Patent Bill to Come Up

WASHINGTON, D. C., May 25—Insisting upon a reform in the patent laws, Congressman Oldfield, of Arkansas, is scheduled to remain at the head of the house committee on patents and when organized the committee will begin immediate consideration of the Oldfield patent bill. The bill will provide a complete revision of the existing laws relating to patents and will seek to prevent the monopolistic control of patents.

One of the objects of the measure will be to circumvent the recent supreme court decision in the Dick mimeograph case, which gives the patentee of the article control over its use and selling price. As the bill will be radical in its nature it is expected the committee will give exhaustive hearings.

Grant a New Detroit Cycle Car

DETROIT, MICH., May 24—The Grant Motor Co. has been incorporated in this city for $100,000 to manufacture a small type of car of the cyclecar class. The officers of the company are George D. Grant, president; C. A. Grant, vice-president and sales manager; David Shaw, secretary and treasurer; G. F. Salzman, factory manager, and J. M. Howe, engineer.

The car, the first model of which may be seen on the streets of Detroit now, is to be known as the Grant. It is really a miniature motor car, having seating accommodations for two people side by side. It has a 20-horsepower, four-cycle motor and a cone clutch, left drive and center control. Wire wheels are used. The tread is 56 inches and the wheelbase 90 inches. The total weight of the machine is 930 pounds and it is designed to sell at $495.

As yet no factory location has been decided upon, but the new company is very active in getting started, and will be in a position to manufacture before long.

SEATTLE, WASH., May 23.—A plant for the manufacture and distribution of the Schram car, a Seattle-made automobile, is to be established within a few miles of the city in the near future. F. A. Mitchell is secretary of the company, the other officers of which are: F. J. Carver, Seattle, president; A. J. Schram, vice-president of the California Motor Car Co., maker of the Sunset car, designing engineer, and W. R. McClelland, treasurer. The concern is incorporated at Olympia with a capital of $500,000.

The Schram will be built in four and six-cylinder models. The six, which will sell on the Coast for $2,200, will have a wheelbase of 135 to 140 inches. The four-cylinder, in touring car and roadster models, will have a wheelbase of 129 inches and will sell at $1,500.

Automobile Securities Quotations

QUOTATIONS of automobile securities on the New York Stock Exchange were subject to irregular changes this week, but due to a strong undercurrent the majority of changes was of an upward nature. However, all changes were very small, being caused by the varying relation of supply and demand.

	1912 Bid	1912 Asked	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co., com	..	125	155	..
Ajax-Grieb Rubber Co., pfd	..	100	95	100
Aluminum Castings, pfd	100	..	98	100
American Locomotive Co., com	42¼	42¾	33¼	34
American Locomotive, pfd	108	108¼	102	103
Chalmers Motor Company, com	..	..	129	138
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	17	19	14	18
Consolidated Rubber Tire Co., pfd	55	60	60	75
Firestone Tire & Rubber Co., com	278	282	254	258
Firestone Tire & Rubber Co., pfd	106½	107½	105	107
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	99	101	..	97½
General Motors Company, com	35	36	27	30
General Motors Company, pfd	75	76	72	76
B. F. Goodrich Company, com. new	86	86½	31½	32½
B. F. Goodrich Company, pfd	108	108½	91	94
Goodyear Tire & Rubber Co., com	275	285	315	325
Goodyear Tire & Rubber Co., pfd	105	105½	98	99¼
Hayes Manufacturing Company	..	104	..	90
International Motor Co., com	28	39	5	6
International Motor Co., pfd	90	94	10	15
Lozier Motor Company, com	45	55	15	20
Lozier Motor Company, pfd	..	..	..	92
Maxwell Motor Co., com	..	..	2½	4
Maxwell Motor Co., 1st pfd	..	..	30	40
Maxwell Motor Co., 2nd pfd	..	..	11	15
Miller Rubber Company	163	165	140	150
Packard Motor Company	104½	106	98	102
Peerless Motor Company, com	..	..	45	50
Peerless Motor Company, pfd	..	..	..	96
Pope Manufacturing Company, com	29	31	13	16
Pope Manufacturing Company, pfd	73	75	47	49
Portage Rubber Co., com	..	..	35	45
Portage Rubber Co., pfd	..	..	90	95
Reo Motor Truck Company	9½	10	10½	11½
Reo Motor Car Company	25¾	26¼	20	21
Rubber Goods Mfg. Co	..	..	105	110
Studebaker Company, com	38	40	26½	27
Studebaker Company, pfd	96	98	90	91
Swinehart Tire Company	108	110	85	88
U. S. Rubber Co., com	..	..	62½	63
U. S. Rubber Co., 1st pfd	..	..	104¾	105¼
White Company	107½	108½	107	110
Willys-Overland Co., com	..	..	60	65
Willys-Overland Co., pfd	..	..	86	92

problems now faced by the companies they stand for, as well as by the users of electric passenger and commercial cars

Motz Tire Is Infringement

Cadwell Patent Anticipates It—Searchlight Cannot Refill Prest-O-Lite Tanks

NEW YORK CITY, May 26—Motz clincher rubber tires, made by the Motz Clincher Tire & Rubber Co., which is owned by the Goodyear Tire & Rubber Co., are an infringement upon the patent rights of Edwin B. Cadwell, the number of the patent being 887,997. This decision was rendered by Justice J. M. Mayer of the U. S. District Court, Southern District of New York, in a suit of Edwin E. Cadwell, Frank P. Johnston, Frank M. Ashley and the Swinehart Clincher Tire & Rubber Co., against the Rapid Safety Filter Co., of New York.

The most important passages of the decision read as follows:

Ordered, adjudged and decreed as follows:

That the letters patent of the United States dated May 19th, 1908, numbered 887,997, issued to Edwin B. Cadwell, of Detroit, Michigan, assignor of one-third to Frank M. Ashley and one-third to Frank P. Johnston (the said Edwin B. Cadwell, Frank P. Johnston and Frank M. Ashley being complainants herein), being the letters patent mentioned and described in the bill of complaint, are good and valid in law as respects claims numbers 7, 9, 10, 13, 14 and 15 thereof.

That the defendant, The Rapid Safety Filter Co., of New York, is a corporation organized and existing under the laws of the State of New York, having its principal place of business in the Southern District of New York.

That the defendant, The Rapid Safety Filter Co., of New York, subsequent to the date of issue of said letters patent numbered 887,997 and prior to the commencement of this action infringed upon claims numbered 7, 9, 10, 13, 14 and 15 of said letters patent numbered 887,997, and upon the exclusive rights of the complainants under the same, by the use, without right or license, of four rubber tires, and which said tires were substantially as described in said letters patent and the claims thereof above enumerated.

That the defendant, The Rapid Safety Filter Co., of New York, in transporting its filters used an automobile equipped with the said four rubber tires; and which said four rubber tires were manufactured by The Motz Clincher Tire & Rubber Co., of Akron, Ohio, and known as the Motz tires.

That a perpetual injunction issue out of and under the seal of this court, enjoining and restraining the defendant, The Rapid Safety Filter Co., of New York, its officers, directors, associates, attorneys, agents, salesmen, clerks, servants and workmen, and each of them, from in any manner, either directly or indirectly, using or causing to be used the said four rubber tires or any of them on any automobile or otherwise or any other similar tires containing and embodying the invention described in the aforesaid claims numbers 7, 9, 10, 13, 14 and 15 of letters patent numbered 887,997.

Motions Denied in Hartford Suit

NEW YORK CITY, May 26—The motion of the Hartford Suspension Co., in U. S. District Court, Southern District of New York, praying for an injunction against the Concrete Bumper Co., has been denied by Justice Lacombe, as was the motion of the defendant to dismiss the bill of complaint. The latter refers to the making of bumpers, the bars of which are filled with concrete. The answers will be filed in the near future.

Abbott Reorganization Completed

DETROIT, MICH., May 27—*Special Telegram*—The complete reorganization of the Abbott Motor Co. by which the control of the business virtually comes into the hands of its creditors has now been effected. Nearly all of the concern's indebtedness is represented in the new directorate which provides a long extension of time on outstanding indebtedness and gives additional money for the proper carrying out of the business.

In addition to the officers announced in THE AUTOMOBILE for last week, A. E. Shaefer, formerly of the Ohio Motor Car Co., vice-president and treasurer, Wade Millis has been made secretary, completing the management. The Board of Directors consists of nine, all except two of the members of which have been named. In addition to the officers, A. W. Lewis, of the Timken company; H. I. Mallory, Weston Mott company; G. W. Rogers, of the Goodyear company, and H. M. Preston, who was heavily interested in the Olds company, have been chosen.

Not to Refill Presto-O-Lite Tanks

INDIANAPOLIS, IND., May 26—In the United States court here last week, Judge Albert B. Anderson handed down a decision in the suit brought by the Prest-O-Lite Co. against the Searchlight Gas Co., in which an injunction to prevent the refilling of Prest-O-Lite Co. by the Searchlight company, together with an accounting and damages, was asked.

Judge Anderson issued a permanent injunction, enjoining the Searchlight company from refilling the Prest-O-Lite tanks before the Prest-O-Lite name plate has been removed. He denied the accounting and damages that were asked.

Market Changes of the Week

SHARP breaks accompanying sluggish markets occurred this week in Bessemer and open-hearth steels, the former dropping $2 per ton and the latter $2.50. Lead was more active and firmer, rising $0.05 per hundred pounds. Tin experienced a rise of $0.18 per hundred pounds, in anticipation of higher rates after the Banca sale in Holland, when 2,500 tons will be offered there. The principal development of interest in the petroleum markets was the announcement of further chartering for exports of petroleum to Norway and Sweden. About 15,000 barrels will be shipped. Both petroleums from the Pennsylvania and Kansas wells remained constant holding their former prices of $2.50 and $0.88 per barrel, respectively. The cotton-seed oil market again promptly responded to the strength in lard with a slight gain of $0.07 per barrel in price. A moderate demand is reported from the dealers in automobile scrap rubber, the market is steadily holding its own and future trading has a promising outlook.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07½	.07½	.07½	.07½	.07½	.07½	.....
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61	.....	
Bessemer Steel, ton	27.00	27.00	25.00	25.00	25.00	—2.00	
Copper, Elec., lb.	.15⅝	.15⅝	.15⅝	.15⅝	.15⅝	.....	
Copper, Lake, lb.	.15¾	.15¾	.15¾	.15¾	.15¾	.....	
Cottonseed Oil, lb.	7.08	7.11	7.10	7.13	7.15	+ .07	
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.....	
Fish Oil, Menhaden, Brown	.34	.34	.34	.34	.34	.....	
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¾	.22¼	.22¼	.....	
Lard Oil, prime	.95	.95	.95	.95	.95	.....	
Lead, 100 lbs.	4.30	4.30	4.30	4.30	4.35	+ .05	
Linseed Oil	.48	.48	.48	.48	.48	.....	
Open-Hearth Steel, ton	28.50	28.50	26.00	26.00	26.00	—2.50	
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.....	
Petroleum, bbl., Pa. crude	2.50	2.50	2.50	2.50	2.50	.....	
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.....	
Silk, raw Italy	....	4.35	....	....	4.35	.....	
Silk, raw Japan	....	3.70	....	....	3.70	.....	
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.....	
Tin, 100 lb.	48.20	48.80	48.40	48.40	48.38	+ .18	
Tire, Scrap	.10	.10	.10	.10	.10	.....	

California Has Model Law

Raises Speed Limit from 20 to 30 Miles Per Hour and Overrules All Local Ordinances

SAN FRANCISCO, CAL., May 23.—The new motor bill passed by the California legislature is the most advanced and comprehensive automobile statute that has been enacted. The bill in general follows the draft of the measure prepared by the Automobile Club of Southern California and except for the amendment providing for the collection of an annual license fee based upon horsepower, it is in all essentials the one fathered by the club.

It also raises the speed limit on country roads from 20 to 30 miles per hour and unifies the speed laws of the various towns and cities within the State by establishing minimum speed limits which cannot be abrogated by local ordinances.

The state has also decided that the annual license fees will be as follows:

For cars of less than 20 horsepower	$ 5
Between 20 and 30 horsepower	10
Between 30 and 40 horsepower	15
Between 40 and 50 horsepower	20
Between 50 and 60 horsepower	25

Annual Licensing Proposed for D. C.

WASHINGTON, D. C., May 26—*Special Telegram*—Annual registration of all motor vehicles, the payment of an annual license fee and the repeal of the wheel tax on automobiles are provided for in a bill framed to regulate the licensing, registration and operation of motor vehicles in the District of Columbia, forwarded by the commissioners to Congress today with a request for its early enactment.

The object of this bill is to vest in the commissioners complete authority to regulate automobile traffic in the district. Section 5 provides for the repeal of all existing laws and regulations on the subject and authorizes the commissioners to make all the necessary regulation anew, to impose all necessary license fees and penalties for violations of the regulations, and to prosecute such violations. It is further provided that all existing motor licenses shall be made to expire December 31, 1913. On and after January 1, 1914, owners of motor vehicles shall be required to obtain new licenses based upon regulations to be adopted by the commissioners. The existing rules governing the operation of motor vehicles in the district are included in special acts of Congress regulations promulgated by the commissioners under special authority delegated to them by Congress and regulations made under their general police authority. The commissioners' views regarding the proposed legislation are set forth in the following letter addressed to Senator Smith, chairman of the Senate Committee on the District of Columbia:

"The commissioners believe that the present speed limits fixed by an act of Congress should be amended and the matter of speed should be left to them to adjust by regulation as the necessities of the case may require. They believe that there should be an annual registration or license fee for motor vehicles and that the existing act of Congress which has been construed as requiring the fee to be paid but once should be repealed. They believe that the imposition of an annual wheel tax against motor vehicles should be repealed. There is no necessity for such a wheel tax, if the proper annual registration of license tax is imposed. At present the owner of a motor vehicle has to pay a registration or license fee, an annual wheel tax and an annual personal tax on a motor vehicle as personal property. The whole matter of the proper annual license fee to be paid should, in the commissioners' judgment, be under their control.

"The commissioners believe it more advisable for Congress to delegate to them the authority of handling the question of automobile traffic than that it should be handled directly by Congress. Conditions change, especially as to the matter of speed and traffic regulations, and if conditions should arise which would warrant changes, the commissioners are not free to bring about the change without the delay incident to a modification in the law by Congress.

"If the commissioners handled the matter, such changes could readily be made by a change in a regulation. The matter is one coming within the general police power, such as has been delegated to the commissioners by Congress and there seems to be no reason why motor vehicles should be exempt from the general police power of the commissioners as is now the case.

"It would be the intention of the commissioners in exercising the authority proposed to be conferred upon them by the bill, to prepare and adopt usual and reasonable regulations such as are in force in other jurisdictions governing the matter of automobile registration and traffic. Under such general authority they would have the power to enter into reciprocal relations with other jurisdictions."

HARRISBURG, PA., May 26—The Grabe Pennsylvania state tax bill, providing for a special fund for the improvement of streets and roads in boroughs and townships, was passed by the house this week. The bill directs the state authorities to collect a one-mill tax for the street and road improvement on personal property, capital stock, bonds of corporations, gross earnings of corporations, bankers, brokers and foreign insurance companies and also on capital stock of brewing companies.

The money thus raised, estimated between $5,000,000 and $6,000,000, is to be kept by the state as a separate fund and to be expended by the state highway commissioner, the distribution of money to be made on a mileage basis of the streets and roads of each borough and township. The bill provides that its provisions become effective December 1, this year, and the distributions are to start April 1, 1915.

Idiotic Tire Bill in Illinois House

NEW YORK CITY, May 27.—A bill is now before the two houses of the Illinois legislature which compares even with such measures as the New York tire-dating bill like a criminal of many years' experience does with a new-born orphan boy.

This product of human genius (?) reads as follows:

Be it enacted by the People of the State of Illinois, represented in General Assembly: That it shall be unlawful, within this state, for any person, firm or corporation to sell, resell or otherwise dispose of any tire to be used on any motor vehicle, unless the same shall have been properly stamped, clearly and legibly, and in the English language, with a die, and in such manner, designate thereon, the date when such tire was originally manufactured or made (or when, if such be the condition, such tire was repaired, with the date of such repair, and whether the same is a new or second-hand tire, and whether or not the same has previously been used) and such tire (when new) shall have a tag pasted thereon, showing the ingredient, composite and component parts thereof.

Violation is to be punished with a penalty of from $50 to $200 for each offense. The bill in this form is No. 217 of the Senate, introduced by Mr. Manny. With the passages in parentheses obliterated, it was introduced by Assemblyman Sullivan as House Bill No. 673.

In this bill, tires are looked upon with as much spirit of national economy as pure food, although it were undoubtedly more to the point, if such measures would be proposed with reference to shoes, hats, toothbrushes, etc., etc.—even though the matter would remain just as ridiculous. So much for the repair history. As to the tag showing the composition of the tire, this is most absurd, as no sane man would seriously expect a manufacturer to proffer his experience, which is a principal part of his business capital, to anyone buying a tire for a few dollars. But, however foolish a measure the bill, it will not escape the eyes of motorists and doubtless will be nipped in the bud.

Night Lights in Connecticut

HARTFORD, CONN., May 26—A bill calling for lights on all light spring vehicles after sunset was called up this week by House Chairman Macdonald in the state legislature. He moved concurrence with the senate amendment which changed the time of lighting from one-half hour after sunset to one hour after sunrise, which was adopted. The Macdonald amendment excepted highways lighted all night by municipalities. This was passed and Mr. Macdonald moved the adoption of the bill. The bill was carried 125 to 54.

Pennsylvania Fights Light Bill

HARRISBURG, PA., May 26—The Pennsylvania Motor Federation is fighting for the senate bill which requires all vehicles to display a light at night. The bill has passed the senate, but is being held up by the public roads committee of the house. This would mean that all carriages, wagons, carts, etc., on the roads at night would have to be equipped at night with lamps. With this law in effect collisions would probably cease.

Nutmeg State Wants No Bridges

HARTFORD, CONN., May 26.—A bill has been introduced in the Connecticut legislature passage of which would put the entire cost of highway bridges on the state. It was pointed out that such a measure once it became effective would let the trolley companies out of their share of cost. An amendment to the act calling upon the state to build and maintain all highway bridges up to 40 foot span was denounced as revolutionary. The state could not stand the expense, it was pointed out.

Makes 87 m.p.h. on Benzol

English Driver Proves Practicability of New Fuel for High Speeds at Brooklands

LONDON, ENG., May 23—One of the most convincing tests on benzol for high speed work was carried out this week on the famous Brooklands racing track, when Louis Coatalen successfully attempted new records in the class to which his car belonged. The 12-16-horsepower Sunbeam car which he drove, running on benzol instead of gasoline, has a bore of 80 millimeters and stroke of 120 millimeters, which is 30 millimeters shorter in stroke than is the case with standard cars. In fact, interest will be aroused when it is mentioned that the engine fitted into this car is identical to those that were installed in the Sunbeam-engined boats that competed at Monte Carlo, and it was owing to the success attained in marine work that Mr. Coatalen decided to see what results could be obtained with benzol on the track. New records were created in the Brooklands cubic capacity class C, wherein the volume must not exceed 150 cubic inches, or 2,458 cubic centimeters contents, so that the Sunbeam engine was well within its class range, being only 2,431 cubic centimeters in volume, or 45 cubic centimeters less than the limit allowed.

For the flying half-mile this car attained a speed of 86.96 miles an hour, and from this distance all class records up to ten laps of the track, or 28 miles, were broken. The ten laps were covered at a speed of 82.5 miles an hour. There is therefore no further room for doubt concerning the efficiency of benzol, for as compared with the previous records set up in this class with engines running on petrol, we find that the records for the ten laps was only 72.46 miles per hour, compared with the new figures of 82.5 miles an hour, and for the half mile the previous best stood at 75 miles per hour, and the old figures were created by cars which had a larger cubic capacity volume than the Sunbeam engine. One point that must not be overlooked is that when starting on the ten lap journey in the first lap, from a standing start, progress was slow, but as soon as the engine warmed to its work it gave a speed of 84 miles an hour.

—

Fear Corner in Benzol

LONDON, ENG., May 20.—Things are developing rapidly with regard to the use of benzol in automobiles in England. The one possibility to be guarded against today is that benzol may be cornered. In fact, there are rumors already of a combine to control it. The suggestion has been made by *The Motor* that the state step in and prevent anything in the nature of trust methods being adopted in handling this new fuel.

The whole motor community is agog with excitement on the subject, particularly as tests with the coal spirit result in surprising results. The engine pulls better with it and a greater mileage per gallon is obtained with it. At Birchenwood in Staffordshire a huge plant for producing motor spirit and all the other by-products has been in full swing for some time, but the bulk of the spirit is contracted for abroad, and the coke produced after all the products are obtained fetches a good price—and is in great demand for metallurgical purposes. The interesting point about this and other plants is that coal of quite indifferent quality can be treated and will produce very good spirit. If plants were erected at other collieries like that at Birchenwood or on the lines of the del Monte low-temperature system our production of home spirit would supply all our requirements without the necessity of importing a single gallon per annum, and we should be using up coal slack or dust and coals of so poor a quality that they are a drug on the market. For instance, cannel coal is a coal that was once used for gas-making in the old days before the use of incandescent mantles. To-day that coal which is too rich in gas cannot be used by the gas companies, so it is running to waste. By either the Birchenwood or the del Monte process this coal yields 20 gallons of excellent spirit to the ton, but the residue is not so good as a burning fuel as that produced by some other coals. Cannel is a slatey-looking coal and is hopeless-looking stuff as a fuel, yet is rich in oil, and what is most interesting is that the supply available for distillation purposes is enormous.

It will be gathered from all this that, providing our collieries erect the plant for treating coal at the pit mouth, by extracting all its valuable properties, which under the wholly wasteful usage hitherto existing have been entirely lost, Great Britain can supply herself at home with all the crude oil and motor spirit she requires, thus rendering her independent of outside supplies, and making her position secure in time of war when her imported supplies might conceivably be cut off.

The position at the moment of writing is an extremely interesting one, and the possibilities are great. I do not think there is any doubt about the ultimate development of the scheme on the broadest possible lines, and I feel quite confident that Great Britain is on the eve of one of the most remarkable industrial revolutions yet recorded in her history.

Put concisely, the scheme is to trap the wastage that can be seen belching from every factory chimney stack and household dwelling in the country and turn it into power and profitable materials, and at the end of it all to produce smokeless fuel. That is the ideal, and we are now on the very eve of its realization.

The reader may ask what about the possibility of the gasoline trust cutting prices when faced with competition of the serious nature portended. Well, that is exactly what I have in mind when I say we must call in the state. This is no small matter of individual interests. It is vital to the country that it shall have its liquid fuel unfettered by any mind of rigging combine. It has been figured out on some processes that the motor spirit can be given away and still the other products will produce a huge profit.

Recently the plant at Birchenwood has increased its output of benzol to over 3 gallons to the ton of coal.

An important development of the home-produced fuel problem is to be found in the fact that our leading daily newspaper, *The Times,* has now fallen in line and in one of its recent engineering supplements deals very fully and very capably with the whole subject of motor fuel production from coal, confirming and emphasizing all that has been published in *The Motor* since it started its advocacy of benzol. This is a very significant step.

With regard to gasoline the situation is unchanged. Prices are unchanged, but the oil controllers are viewing the growing demand for benzol with some signs of uneasiness. At present there are difficulties in obtaining the English spirit in many parts of the kingdom, but as soon as we can create sufficient demand at home to hold up the exports, supply and demand will adjust themselves. The gasoline people are wonderfully organized here as regards distribution, but the benzol business is for the present quite hopelessly handicapped in that direction. There are restrictions about distribution in bulk—the 2-gallon can is the only legalized form—which place it at a very serious disadvantage. Shell spirit can be purchased in 2-gallon red tins in every small village throughout the kingdom.

—

Ohioans Against Double Tax Law

COLUMBUS, O., May 27—Both of the warring factions in the Ohio State Automobile Association were brought together and all differences were buried at the annual meeting of the organization held at Columbus May 24. The meeting was harmonious in every respect and was attended by representatives from seventeen auto clubs in the Buckeye State. In all thirty-seven delegates were present representing about 4,000 members of all of the clubs.

One of the most important actions was the adoption of a resolution instructing the new executive committee to take legal steps to have the new Warnes double-taxation law declared unconstitutional.

Officers were elected as follows: President, C. C. Janes, Columbus; first vice-president, G. E. Mentell, Springfield; second vice-president, W. L. Faunce, Youngstown; third vice-president, W. L. Winning, Dayton; secretary, L. M. Browne, Columbus, and treasurer, I. H. Allen, Kenton. The president was empowered to name all standing committees.

—

AUSTIN, TEXAS, May 24—In order to show the need of legislation governing the registration of automobiles and with a view of having a measure of this character passed at the special session of the law making body which is to be held in July, statistics have been collected showing that in 1912 there were 10,000 automobiles registered in Texas. This shows an increase of 65 per cent. over the registration in 1911.

The Automobile

PUBLISHED WEEKLY

Vol. XXVIII Thursday, May 29, 1913 No. 22

THE CLASS JOURNAL COMPANY

H. M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
231-241 West 39th Street, New York City

BRANCH OFFICES

Chicago—910 South Michigan Avenue Detroit—505 Free Press Building
Boston—1035 Old South Building Cleveland—309 Park Building

EDITORIAL

David Beecroft, Directing Editor
Donald McLeod Lay J. Edward Schipper
Sydney Oxberry Hans W. Weysz
L. V. Spencer, Special Representative, Detroit

Francis L. Wurzburg, Advertising and General Manager

ADVERTISING

H. J. Garrison, New York C. H. Gurnett, Chicago
F. B. Barnett, Cleveland F. J. Robinson, Chicago
W. L. Chapman, Boston L. G. Vogel, Detroit
C. K. Brauns, Buffalo

Cable Address---------- Autoland, New York
Long Distance Telephone---------- 2046 Bryant, New York

SUBSCRIPTION RATES

United States and Mexico ---------- One Year, $3.00
Other Countries in Postal Union, including Canada ---------- One Year, 5.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

The Indianapolis Cars

IN the descriptions and specifications of the cars to contest in the 500-mile race at Indianapolis this week the observer cannot but note the reduction in motor sizes as compared with a year ago, the maximum limit for this season being 450 cubic inches as compared with 600 a year ago. The result of this reduction cannot be stated until after the race but the management is to be congratulated in reducing the maximum of last year by 25 per cent. in that it is in keeping with present day trends of automobile construction. From announcements already made by manufacturers, the motors of 1914 will average lower in horsepower than those of 1913. There is a general reduction in bore and stroke. Racing has taught its lessons in Europe and America and will continue to teach them and if Friday's race of this week, under conditions practically parallel to those of a year ago, can demonstrate speeds as fast as made by the winner last year then there is done genuine good. The days of bulk are passing, the days of efficiency are at hand. The small motor is showing its superiority in test and in economy.

This year France is combining fuel economy with speed in its important road races It is to be hoped that next year Indianapolis will add the fuel economy feature and also the oil feature. By so doing the management will be conferring a favor on the industry at large in this country.

A Three-Fold Contest

THE recent Catskill reliability contest, in which reliability on the road, hill-climbing reliability and economy of gasoline consumption were taken into consideration as factors in determining the grand winner, has opened the way for developing increased interest in competitions of this nature. Some years ago the individual reliability contest was an attractive field of battle for the manufacturer. The hill-climb was equally interesting. The economy contest never became popular but, whenever held, developed not a little interest It lacked the spectacular features of the hill-climb and the continued interest of the long-distance reliability. Combining the three proved particularly popular in the contest referred to and will be a success in future.

The three-in-one contest meets the requirements of the automobile owner better than any other type of contest. It develops economy and reliability.

The most satisfactory method of properly proportioning the importance of each with regards to the other must receive consideration. On a basis of 1,000 points 600 were given for reliability, 200 for hill-climbing and 200 for economy in the test referred to. It is debatable if this proportion should not be slightly altered, giving 250 for economy and 150 for hill-climbing.

It will not be too difficult to accurately gauge the relative economy of the contestants because under the formula generally used, which takes into consideration the vehicle weight with load and the amount of gasoline consumed, it is possible to put all of the contestants into a common division and give the small car an equal standing with a large car, the reasoning in connection with this being that the lighter weight vehicle will have a smaller motor, proportional to its load, than the larger vehicle. In years past it has been generally argued that the economy run decided on these two factors has generally favored the heavier vehicle and placed a premium on weight. It is a question of open debate whether this has actually been the case or not, and if it can be proven that such is the case then the formula should be altered so as to place a discount on weight and a premium on that nicety of proportion between motor capacity and load carried so that the motor will work at its point of maximum efficiency most of the time.

A new scheme of reckoning must be established for hill-climbs; in other words a formula must be introduced the same as in fuel tests. Some years ago a formula was used in determining the winner in the Algonquin Hill-Climb at Chicago. This formula took into consideration the weight of the car, the piston displacement of the motor in cubic inches, and the length of time to climb the hill computed in seconds. The result was that all of the vehicles competed in a common class so far as determining their standing was concerned. It is possible to use some similar formula in the new three-in-one contest, and the results so obtained would be immeasurably more satisfactory than those obtained on a time basis only.

It is to be hoped that more of these three-way contests will be staged. It is excellent advertisement to the industry. It gives an opportunity of renewing that interest in contests of this nature which is so desired to-day.

The Ideal Garage for Electric Cars

From a Paper Read by H. M. Martin Before the Electric Vehicle Association of America, at the Meeting Held Tuesday Evening, May 27.

SIMPLICITY and cleanliness are the electric's prominent characteristics, and these ideas can be exemplified in an electric garage which will be complete in every detail, and yet be in strong contrast to the more elaborate equipment and larger space necessary to garage and repair gasoline cars.

The location of the garage should be central with regard to the places of business of its customers. Since customers are not usually promised in advance, other conditions assume greater importance. If possible, it should be on a well-paved street near a main artery of travel—and here we strike the first necessity for compromise since property of this description will probably be too expensive.

The number of floors of the building will be determined by a compromise between the cost of additional vertical construction with all that that implies, elevators, etc. Particularly if there are many floors, the elevators (of which there must be at least two) will be of as high a speed as good judgment will allow, because on the elevators' speed will depend the number of cars that can be accommodated.

Electric Elevator Control

Electric control from the car should, of course, be employed instead of the usual hand rope. The electric control precludes the possibility of starting the elevator by anyone not on the platform itself. Automatic gates will prevent, nine times out of ten, the serious accident of having a car fall down the shaft.

It is preferable to have no posts to interfere with the free movement of cars, though to leave them out will add materially to the initial expense and make the floors thicker and the whole building higher. If posts must be used, let them be spaced with regard to the number and sizes of cars that are planned to stand between them.

Concrete floors should be painted with a preparation giving them a smooth surface which is easily cleaned and saves the concrete from wear and gritty dust from rising. These floors should be pitched slightly from the center line down to the side walls, both ways, with gutters formed in the concrete along the walls so that washing may be done, if necessary, without moving the cars.

Lighting should be well distributed, and each floor's lights controlled in several groups for the sake of economy of current. Around the walls, at frequent intervals, receptacles should be installed for drop cords so that these need not be of an unhandy length. The wall receptacles should be of sufficient capacity to take care of a portable drill.

The heating system should be ample to keep all floors, where cars are stored, up to at least 30 degrees during the coldest weather. This is essential in order to start the batteries out warm. A gasoline garage can get along with any temperature above 32 degrees, but not so with the electric.

The charging equipment, switchboard, wiring, etc., should be of approved type, solid and well erected. This apparatus is so standardized that no special remarks are necessary except to suggest that rheostats, being usually grouped as closely together as their frames will permit, should be ventilated in summer.

Ventilation should also be well looked to in the battery repair room, for here batteries are often gassing for a day or more on their initial charge. The floor of this room demands special attention, acid-proof brick or tiles laid in pitch being the best construction. It is of the utmost importance that the drainage system from this department—all the way to the sewer—should be either of lead or glazed earthenware, and preferably run as "open plumbing," not buried in the walls.

A small machine tool equipment is a very useful adjunct in an electric garage, even where most of the work is sent out. A lathe, drill press and emery wheel will do most of the odd jobs that come up from day to day. A more complete equipment would include a sharper milling machine and power hack-saw. If the garage is to be complete to handle everything that may become necessary, it should include well-equipped carpenter and paint shops. There is much to be said in favor of this, since then a car need never leave the garage except for its daily work.

Now as to management: In the first place, let there be one head to the entire system. If it is possible (and it ought to be nowadays) to combine in one person business ability and a thorough technical knowledge of the industry, then this is the desideratum. If not, then let the head be by choice a good business man, with a broad enough mind to know his limitations in other fields and to trust his well-chosen subordinates.

There are a number of important questions that come up for decision almost daily in the operation of a garage. For instance, shall the customer be billed for accidents which may have been preventable? There are some garage managers, I am afraid, who regard such accidents in the light of "acts of Providence" especially provided to furnish them a source of revenue. In general, it may be said that a public garage cannot afford to have as many really preventable accidents as a private garage can.

Another question is, just what repair shall be included in the flat monthly rate? Minor adjustments are conceded without extra charge, but there are a number of repairs that become necessary from time to time that hardly come under this head. An owner asks to have his smashed tail lights straightened out, or new licenses put on, or perhaps says: "Just lend me a bell, or a spring, or an armature (as the case may be) until mine is repaired," the word "just" indicating that he does not expect to be charged for the service. Sometimes it is hard to decide just how far generosity can be stretched, but, as a rule, I may say that it all depends on the customer's record.

Small Cars Pay the Dividends

At the present rates charged for garaging, the small cars are the ones that pay the dividends. This is not because the rates are so far from equable, but because the small car on the average does not carry so large a proportion of its possible load as does the large one.

In dealing with the owners of commercial cars, as a rule, it is only the recent purchaser who is unreasonable and not willing to meet the garage management half way in the matter of disputes on bills or service rendered.

A few words about pleasure cars:

In dealing with the owners of pleasure cars, considerable tact is required, rather than straight business acumen. A good many of these owners have no special interest in understanding the workings or limitations of their cars, and consequently there is no common ground on which an argument can be based. On the other hand, some owners consume a lot of the garage manager's time in arguments and explanations of "how it all happened." Both the commercial car manager and the pleasure car manager have all they can do, but the first has the easier job.

The 1913 Targa Florio

Nazzaro's Skilled Driving and Reliable Car Are Winning Factors

PALERMO, SICILY, May 14—Felix Nazzaro's success in the Targa Florio race was due to skilled driving and an absolutely reliable car. It was a race in which the man counted for much. Starting from Palermo, the competitors had to make a complete circle of the island of Sicily, the road keeping within sight of the Mediterranean practically the whole of the way. Throughout the 650 miles there was not a straight stretch of more than a quarter of a mile, the greater portion of the route forming a ledge cut on the mountain side, with hairpin turns, and short, steep gradients. The regulations allowed a cylinder volume of 549 cubic inches, but owing to the nature of the road it was impossible to make use of all the power available from such dimensions and very few of the competing cars approached the limit. Quick acceleration was an important factor, the weight problem had to be carefully studied, the cars required a wide steering lock and moderate wheelbase and the course was too dangerous for dare-devil driving. No attempt was made to guard the roads; the competitors had to take their chance of meeting with mountain mules which became scared at the sight of an automobile, and of Sicilian peasants who were hardly less frightened.

Thirty-seven Cars Start

Thirty-seven cars lined up for the start, which was given in the center of the town of Palermo at 5 a. m., the first car to get away being a Minerva with Knight motor. The others followed at intervals of 10 minutes. Practically all the cars were standard touring models stripped as low as possible for racing purposes. The equipment consisted of nothing more than a couple of seats, a gasoline tank, three to five spare wheels or tires, and a couple of headlights. These latter were necessary on account of the start of the second stage of the race being given to the leading car at midnight. Italians figured most prominently in the race. Among the foreigners were five American cars: an Overland, two Fords, a Metz, and a Flanders. France had an eight-cylinder De Dion Bouton and a 20-30 Renault; Belgium had one Minerva, with Knight motor; Switzerland had a couple of Sigma, also with Knight motor; and Germany was represented by a Mercedes team.

The first stage stopped at Girgenti, after a run of 447 miles. The real struggle on this stage was between Felix Nazarro, on his own car and Marsaglia on the Aquila-Italiana of which he is the designer. Marsaglia had started eighth, or nearly 2 hours before Nazzaro, and was therefore not aware how dangerous his competitor might be. This first stage proved a weed-

Fracassi taking the curves in a Ford

Giordano coming through a pass in his Fiat

Nazzaro, the winner, and his Nazzaro car

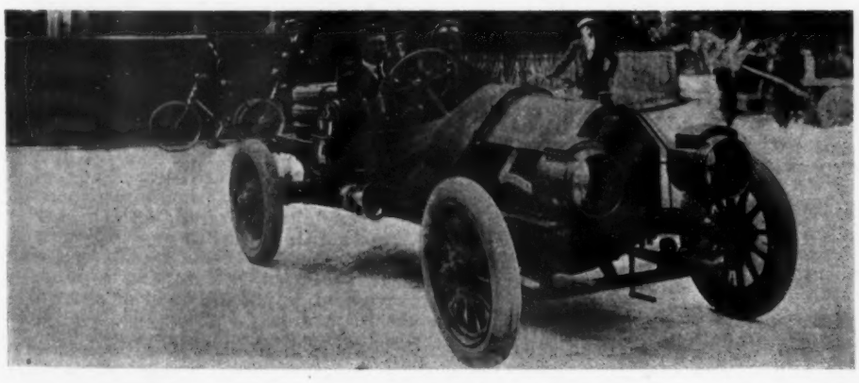
Berra, fourth, in his eight-cylinder De Dion

in Picture and in Story

Demoraes crossing a culvert in his Fiat

Cejrano and his S.C.A.T. at high speed

Diana, Isotta, was ninth to finish the race



Berla and his Aquila ready for the race

ing out of the weaker cars and of the less skilled of the drivers, only sixteen of the competitors getting to Girgenti within the time allowance. Marsaglia maintained his lead on the first day's run with an advantage of 30 minutes on Nazzaro. Bordino on Lancia came in a very close third, there being an interval of more than an hour between this car and the fourth. Of the American competitors only the Overland was able to finish the first stage, Lopez bringing his car into tenth position sandwiched between a De Vecchi and an Isotta.

On their arrival at Girgenti the cars were locked up, the continuation of the race being fixed for midnight for the first car, Marsaglia's Aquila-Italiana, the others following with the same interval as marked their arrival. At an early stage Marsaglia had trouble with his headlights, which gave Nazzaro a chance to creep up to him and finally get ahead.

Bordino, who had finished the first stage a good third, had trouble on the second day's run, causing him to fall back to eighth place.

One of the rotary valve Italas dropped out, and the Overland crept up two places, finishing seventh. The cars which fell out on the second day's run were Itala, Isotta, Fiat, Sigma (Knight), and Mercedes.

Speed Was 33.5

Nazzaro's speed worked out at the average of 33.5 miles an hour, which is considerably faster than any other competitor has made over this course. In 1907 Nazzaro won the Targa Florio for Fiat, the race on that occasion being three rounds of the island. The winning Nazzaro car is a standard model built by Nazzaro at Turin, and having a four-cylinder block motor of 3.9 by 5.5 inches bore and stroke. The cylinder make, a fine, clean-cut casting with integral intake and exhaust manifolds, and having the body of the water pump cast with the crankchamber.

The Aquila-Italiana with which its designer, Marsaglia, finished second, has a six-cylinder motor of 3.1 by 5.1 inches bore and stroke, the construction being distinctive by reason of the block casting of cylinders and upper half of crankchamber.

Results of Targa Florio Race

Nazzaro	Nazzaro	19:28:40
Marsaglia	Aquila-Italiana	20:43:49
Gloria	De Vecchi	21:48:04
Berra	De Dion Bouton	22:22:25
Giordano	Fiat	22:26:04
Sivocci	De Vecchi	22:47:00
Lopez	Overland	23:12:47
Pordino	Lancia	23:43:25
Diana	Isotta	23:46:00
Stabile	Minerva (Knight)	23:59:04
Turner	Renault	24:30:00

Position at End of First Stage

Marsaglia	Aquila-Italiana	13:04:13
Nazzaro	Nazzaro	13:34:44
Bordino	Lancia	13:56:52
Giordano	Fiat	15:03:34
Gloria	De Vecchi	15:14:09
Stabile	Minerva	15:16:37
Berra	De Dion Bouton	15:22:19
Negri	Itala	15:31:51
Sivocci	De Vecchi	15:38:10
Lopez	Overland	15:52:39
Diana	Isotta	16:15:57
Turner	Renault	16:17:21
Conti	Isotta	17:38:08
De Romase	Fiat	17:42:12
De Prosperi	Sigma (Knight)	18:27:00
Inglese	Mercedes	19:09:23

Developments in the Trade Field

SPLITDORF Service Station Established—The Splitdorf Electric Co., Newark, N. J., has established a thoroughly equipped service station. J. H. Dickinson is manager.

Newton Opens Cedarhurst Garage—S. E. Newton has opened a garage in Cedarhurst, L. I.

Philadelphia Hood Tire Agent—The Petry-Cassidy Co., Philadelphia, Pa., has been appointed agent for the Hood tire.

Haskins Krit Manager—C. B. Haskins has been appointed manager of the retail branch in Buffalo, N. Y., of the Krit Motor Car Co.

Lininger Keeton Purchasing Agent—W. Lininger has joined the Keeton Motor Co., Detroit, Mich., as purchasing agent and office manager.

Chicago Ward Leonard Agent—The Badt-Westburg Electric Co., Chicago, Ill., has been appointed agent for the Ward Leonard Electric Co., Bronxville, N. Y.

Peete Rayfield's Detroit Manager—R. C. Peete has been appointed manager of the Detroit, Mich., branch of the Rayfield carbureter, located at 997 Wodward avenue.

Edwards Adopts Hartford Absorbers—The Edwards Motor Car Co., Long Island City, N. Y., has adopted Truffault-Hartford shock absorbers as standard equipment.

Ajax In New Location—The Boston, Mass., branch of the Ajax-Grieb Rubber Co. has been moved from Park Square where it was for years to a new home at 1084 Boylston street.

Powers Hood Tire Manager—F. Wade Powers has been appointed general manager of Petry-Cassidy, Inc., Philadelphia, Pa., which recently took the local distribution of Hood tires.

Jameson Resigns from Maxwell—W. B. Jameson, who was with the Maxwell-Briscoe Motor Co. from 1904 on, has resigned his connection with the Maxwell Motor Co., Inc., Detroit, Mich.

Weber Out of Walpole—E. P. Weber, who has been manager of the Boston, Mass., branch of the Walpole Tire Co., ever since that company made its entry into the tire business, has resigned.

Adams Stewart-Warner Advertising Manager—Gridley Adams has been appointed advertising manager of the Stewart-Warner Speedometer Corporation, with headquarters at the Chicago, Ill., plant.

Cowling Resigns from Case—J. G. Cowling, for the past 12 years connected with the J. I. Case T. M. Co., Racine, Wis., has resigned to accept a position as vice-president of the Federal Pressed Steel Co., Milwaukee, Wis.

Oldsmobile Change—W. B. Fewell, for some years manager of the New England branch of the Oldsmobile at Boston, Mass., has just resigned and his place has been filled by the appointment of L. G. Dodge.

Overland's Racing Track—The Willys-Overland Automobile Co., Toledo, O., has purchased sufficient land in the rear of its Central avenue plant to build a half-mile racing track. This track will be used for testing cars.

New Marion Garage—N. H. Davis, Marion, O., agent for the Ford, has purchased a site on South Prospect street upon which he will erect a one-story garage and salesroom. The structure will be of cement block construction.

With Campbell-Ewald Co.—N. T. Brotherton, formerly secretary and advertising manager of the Keeton Motor Co., Detroit, Mich., has resigned those connections to join the staff of the Campbell-Ewald Co., advertising specialists, that city.

Malley Resigns In Boston—Charles Addison Malley, who was instrumental in forming the M-B-M Co., to handle the Maxwell line at retail in Boston, Mass., has resigned and the new company is now under the management of E. H. Marsters.

Humpage in New Field—F. R. Humpage is now president of the International Color & Chemical Co., Inc., Buffalo, N. Y. This company is now installing a plant in Bridgeport, Conn., which will be in active operation within the next 2 weeks.

Bradford Joins Maxwell—J. R. Bradford, for the past 5 years assistant manager of the Boston, Mass., branch of the Buick Co., who recently resigned, has been made sales manager of the M-B-M Co. of that city, retail handler of the Maxwell cars.

Wolverine Club Quarters Moved—The quarters of the Wolverine Automobile Club, Detroit, Mich., have been removed from the Tuller Hotel to the new location in the Springfield Building, on Woodward avenue opposite the Pontchartrain Hotel.

Mayo On the Job—George H. Mayo, formerly with the Hubmark Rubber Co., is now the manager of the Enterprise Rubber Co., in Boston, taking the place formerly occupied by William E. Barker, who has gone to New York with the U. S. Rubber Company.

Wacker Resigns from Simms—G. W. Wacker has severed his connection from the Simms Magneto Co., New York City. He was sales manager of this company prior to its reorganization last July. Since then he was the engineer in charge of the Bloomfield, N. J., works.

Detroit Firm Surrenders Charter—The Lee & Porter Mfg. Co., Buchanan, Mich., recently consolidated with the Lewis Spring & Axle Co., Jackson, Mich., and will surrender its charter and all its business in the future will be carried on under the direction of the Lewis concern.

Oakland Moves In Boston—Manager Fred Walsh of the New England branch of the Oakland Motor Car Co. has moved the Boston, Mass., salesrooms from Boylston street to the old quarters of the United Motors Boston Company, corner of Massachusetts avenue and Newbury street.

Will Motorize Mail Service—Two automobiles used in the collection of mail in New Orleans, La., have proven that they can handle the work of eight of the wagons which are in use. The test was made under the personal observation of the superintendent of mails, who has authorized the installation of two cars for the service. It is intended to motorize the entire service.

Automobile Mart Formed—The Automobile Mart Assn. was recently formed in St. Louis, Mo., by J. J. Behen, who is its president. Its purpose is to facilitate the sale of used, renewed and rebuilt automobiles. Arrangements are being made for the holding of a mart in the near future where a large assortment of automobiles and trucks of different makes and models will be displayed and demonstrated.

Gasoline Freight Rates Cut—The United Fruit Co. has made a 20 per cent. cut in its freight rate on gasoline between New Orleans, La., and Puerto Barrios. This is the result of a protest made by the automobile owners in Guatemala City. The government also has been asked to reduce the duty on gasoline so that the price, which is almost prohibitive, from 75 cents to 85 cents a gallon, may be reduced.

New Lozier Manager—The resignations of manager R. B. Nettleton and George C. Crittenden, as branch manager and sales manager respectively of the New England branch of the Lozier, recently brought sales manager Paul Smith to Boston, Mass., on a hurried trip to install E. R. Hunnewell as manager of the New England branch. Messrs. Nettleton and Crittenden have gone over to the newly formed Chandler Motor Car Co. of New England, and will occupy the same positions they had with the Lozier branch. Temporary salesrooms have been secured at the new Fenway garage in the Back Bay.

Cultivating Rubber In Peru—In order to make possible the cultivation of rubber in the Madre de Dios region of Peru the government has established an agricultural experiment station. The reckless exploitation of the wild rubber trees in recent years is resulting in the death of many trees and ultimately will mean the stopping of the supply unless steps are taken quickly to protect the trees and arrange for cultivation. The government is offering inducements to colonists to undertake the cultivation of rubber plants. Instruction to the farmers of the Madre de Dios region will be given free at the new station.

Many Factories Under Construction

GORDON Rubber Erecting Plant—A contract will be let in the near future by the Gordon Rubber Co., Canton, O., for two brick buildings to be erected at Williams street and the B. & O. crossing. The company expects to occupy the new structure by July 15. The main plant of the company is now located at Beach City, O., and it will be consolidated with the Canton, which will be the headquarters. The new plant will cost $25,000, consisting of two buildings, one story high, one to be 165 by 40 feet and the other 200 by 40 feet.

Bridgeport Motor Co.—The Bridgeport Motor Co., Bridgeport, Conn., is erecting an addition to its plant.

Allen Contemplating Addition—The Allen Motor Car Co., Fostoria, O., is considering the erection of an addition to its factory.

A. & J. Doubles Capacity—The A. & J. Mfg. Co., Binghamton, N. Y., has completed plans for the doubling of the capacity of its plant on Noyes Island.

New Equipment Worth $30,000—The Chicago, Ill., Pneumatic Tool Co., manufacturer of the Little Giant motor truck, is adding $30,000 worth of equipment to its factory.

U. S. Rubber Adding—The United States Rubber Co., Indianapolis, Ind., is building a new addition to its Indianapolis, Ind., plant and is using reinforced concrete for frame, floors and roof.

Hughey Will Erect—W. J. Hughey & Son Co., Chicago, Ill., will erect a factory on Prairie avenue and Thirty-third street for the manufacture of motor trucks. The estimated cost is $100,000.

Chase Doubles Office Capacity—The Chase Motor Truck Co., Syracuse, N. Y., has had plans completed for doubling the capacity of the general offices and extending the manufacturing facilities.

Rochester-Mais Plans Factory—The Rochester-Mais Commercial Car Co., Rochester, Ind., recently organized, is having plans prepared for a new factory to be used for the manufacture of motor trucks.

Ford's Chicago Warehouse—The Ford Motor Co., Detroit, Mich., is proceeding with the construction of its six-story factory and warehouse at Chicago, Ill. The building will be 160 by 230 feet and will cost $400,000.

Hewitt's Three-Story Building—The Hewitt Rubber Co., Buffalo, N. Y., has been granted a permit to proceed with the construction of a three-story factory building, to be of concrete and cement construction and 40 by 48 feet in size.

One Hundred Hups a Day—The Hupp Motor Car Co., Detroit, Mich., is building and shipping 100 Hupmobiles a day. This company has erected a huge tent adjoining the executive building to be used for assembling purposes and a test department.

Trenton Company Builds Addition—The Fitzgibbon & Vrisp Co., Trenton, N. J., manufacturer of carriage and automobile bodies, has taken out a permit to build an addition to its plant. The structure will later be equipped with new machinery.

Overland Planning Extension—The Willys-Overland Co., Toledo, O., is planning for a further extension of its Toledo plant and to make it possible for it to do so the City Council at its last meeting vacated a number of streets and alleys, most of which were paper thoroughfares only.

Bids $22,500 for Middleby Plant—Although $22,500 was offered for the plant of the Middleby Automobile Co., Reading, Pa., at public sale recently held by the executor, M. A. Gherst, the sale was continued, because, in his opinion, the bid was too small. For the building $13,000 and for the equipment $9,500 was bid.

Pope's Production Increasing—The production at the factory of the Pope Mfg. Co., Hartford, Conn., has been at a good rate and without interruptions. To date the company has built approximately 1,100 Pope-Hartfords as against 531 in the same period in 1912 season and 820 for all the twelve months to July 31 last.

Jefferson Wants New Firm—At a meeting of the business men of Jefferson, O., recently, a resolution was adopted providing that as soon as the Pressed Steel Motor Car Co. would bring a completed car to Jefferson and place $25,000 in a local bank, the citizens of that city would raise $25,000 to buy a site and erect the initial building for the establishment of the automobile concern.

Ohio Electric Planning Extension—The Ohio Electric Automobile Co., Toledo, O., is planning an addition to its plant which will practically double its capacity and will employ 200 additional men. The Ohio Electric makes 55 electric pleasure vehicles a month. The new building will adjoin the present four-story brick plant, will be of the same height and dimensions, and will cost $100,000.

Swartz Electric Purchases Factory—The Swartz Electric Co. has bought a factory building and 1 acre of ground opposite the Indianapolis, Ind., Motor Speedway, the consideration being $10,000. Arrangements are to be completed immediately to erect two additional fireproof factory buildings and these and the building now on the site will be occupied by the company, which manufactures electric lighting equipment.

The Automobile Calendar

Shows, Conventions, Etc.

June 2-7	Racine, Wis., "Made in Racine Exposition," J. I. Case Co.'s foundry.
June 5, 6, 7	Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October 13	Philadelphia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.

Race Meets, Runs, Hill Climbs, Etc.

May 29-30	Chicago, Ill., Inter-Club Reliability to Indianapolis, Ind., Chicago Motor Club vs. Illinois Athletic Club.
May 30	Indianapolis, Ind., 500-Mile Race, Speedway.
June 5	New York City, Orphans' Day Picnic at Glen Island, Orphans' Automobile Day Assn.
June 7	Philadelphia, Pa., Inter-Club Reliability, Quaker City Motor Club, Automobile Clubs of Delaware County, Philadelphia and Germantown.
June 10	Columbus, O., Reliability Run, Columbus Automobile Club.
June 14	Cincinnati, O., Hill Climb, Cincinnati Auto Dealers.
June 14-15	San Francisco, Cal., Track Races, E. A. Moross.
June 16, 17, 18	Columbus, O., Reliability Contest, *Ohio State Journal*.
June 19	Chicago, Ill., Algonquin Hill Climb, Chicago Motor Club.
June 21	Cincinnati, O., Hill Climb, Cincinnati, O., Automobile Dealers.
June 21	Philadelphia, Pa., Fletcher Cup Run, Automobile Club of Philadelphia.
June 21-22	San Francisco, Cal., Track Races, E. A. Moross.
June 23	Des Moines, Ia., Little Glidden Tour, Iowa Automobile Assn.
June 25-28	Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1	Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Assn. to the Pacific Coast.
July 1-16	Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4	Columbus, O., 200-Mile Track Race, Columbus, O., Automobile Club.
July 4	Taylor, Tex., Track Meeting, Taylor Auto Club.
July 4	Washington, D. C., Track Races, National Capital Motorcycle Club.
July 4-5	Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Assn.
July 5-6	Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16	Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 11	Twin City, Minn., National Reliability Tour, A. A. A.
July 20	Seattle, Wash., Track Races, E. A. Moross.
July 27	Grand Rapids, Mich., Tour, Grand Rapids Auto Club.
July 27-28	Tacoma, Wash., Tacoma Road Races.
July 28-29-30	Galveston, Tex., Beach Races, Galveston Automobile Club.
Aug. 5	Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.
Aug. 12	Kansas City, Mo., Reliability Tour, Kansas State Auto Assn.
Aug. 29-30	Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.
Aug. 30-Sept. 6	Chicago, Ill., Reliability Run, Chicago Motor Club.
Sept. 1	Columbus, O., 200-Mile Track Race, Columbus Auto Club.
Sept. 9	Corona, Cal., Track Race, Corona Auto Assn.
Oct. 4-11	Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co.
Nov. 24	Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27	Savannah, Ga., Grand Prize Race, Automobile Club of America.

O'Kill Is a Simple Pressure Indicator

By Professor W. C. Marshall

IT is a well-known fact that the successful design and the economical working of the steam engine were brought about by the invention of the indicator.

The original design consisted of a tube within which a spring was compressed by the pressure of the steam from the engine cylinder acting on a piston fastened to one end of the spring. The movement of the piston was recorded on a strip of paper by means of a pencil attached to the moving piston. The paper was made to move by connecting it to the reciprocating parts of the engine.

The first engines to use such indicators made few revolutions per minute and used steam at low pressure.

The line traced by the pencil on the moving paper was an indication of the pressure within the cylinder of the engine at every point of the stroke of the piston.

As the speeds of engines increased the inertia of the spring caused the pressure line of the indicator card to become a series of waves, making it difficult to determine the true pressure line.

Shortening the spring and at the same time lightening the moving parts of the pencil-actuating mechanism, obviated this difficulty for speeds used in steam engine practice.

When gasoline engines began to increase in numbers the same difficulty, which had caused steam engine designers so much difficulty years before, presented itself.

The optical indicator or manograph was invented to be used at speeds of rotation of from 700 to 2,500 revolutions per minute. The pencil of the old style indicator was replaced by a beam of light. This beam of light striking a ground glass screen traced on it the indicator card of pressures in the engine.

Permanent records were made on sensitized paper which was afterwards developed and fixed in the photographic dark room.

The manograph was expensive, hard to attach, and much too cumbersome to carry on an automobile or motor boat.

As the power of an internal combustion engine depends on the compression and explosion pressures in its cylinders, it becomes an important matter to determine what these factors are in a given engine.

In case there are several cylinders it is advisable to divide the work equally among them. This can only be done by having the same compression and explosion pressures in them all.

A manograph is not necessary to determine these pressures, nor could it be used without considerable trouble.

Mr. J. O'Kill, M.I.A.E., has designed a pressure indicator which enables the maximum pressure in an internal combustion engine cylinder to be determined accurately and easily.

This instrument is shown in Fig. 1, and is about 7 inches high, its maximum diameter being 2.5 inches. It is attached to the motor by screwing into the spark-plug hole, in case there are two plugs in the cylinder, or by unscrewing the petcock used for priming and screwing in the connection shown in Fig. 1 at the lower left.

This serves for one cylinder at a time in a multi-cylinder motor. Other arrangements for rapidly connecting each cylinder to the indicator will be shown further on.

The working of the indicator is explained by referring to Fig. 2, which is a vertical longitudinal section.

Pressure from the cylinder of the motor enters the casing A through the hole H_1 and causes the piston B to rise a short distance. This upward motion is opposed by the

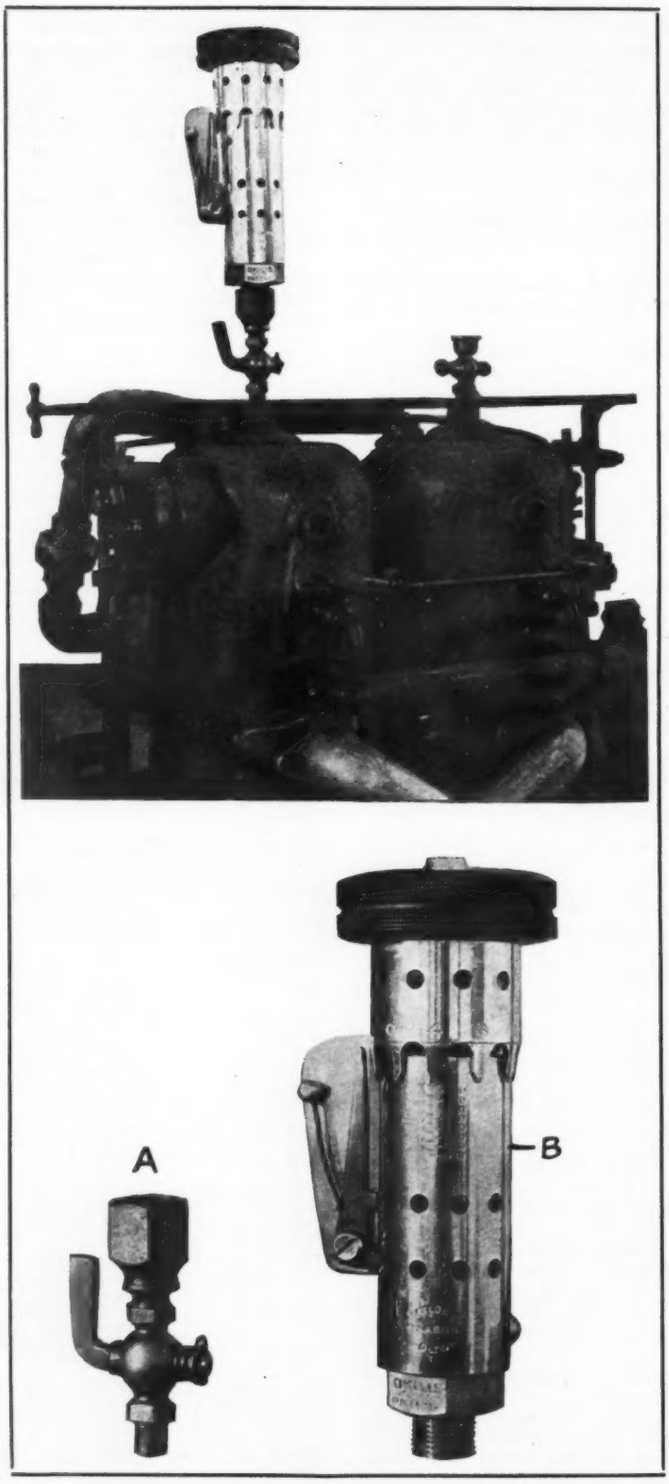


Fig. 1—Upper: O'Kill indicator as it appears mounted on the cylinder ready to give pressure readings. Lower: Enlarged view of the O'Kill indicator and the valve by means of which it is attached to the motor cylinder which is to be tested by the instrument

plunger F which is pressed downward by the helical spring.

Any rise of B causes the bell crank H to turn about its fulcrum K and its upper end to vibrate along the scale E.

By turning the milled rubber head L of the sleeve D the compression of the spring may be varied until the piston B does not rise and the finger H stops vibrating.

The lower edge of sleeve D is made like a micrometer caliper. On the casing C is a vertical scale graduated to 40 pounds. One complete turn of the sleeve D causes a vertical motion equal to one of these divsions and adds or takes off 40 pounds from the spring. As the lower edge of the sleeve is divided into ten divisions by turning it through the space of one division we can read to 4 pounds.

These divisions, as well as the graduated vertical scale, are shown at B in Fig. 1.

Plunger F can rise but a short distance before striking the casing C.

Its lower end is spherical and bears against the top of piston B.

A hole is drilled from the outside of the piston B to its axis, where it meets a hole drilled from the top of the piston.

As the plunger and its stem also have an axial hole, any oil injected at the top of the plunger stem finds its way to the outside surface of the piston, preventing leakage and sticking of the piston.

If we wish to obtain the compression pressure in a cylinder the indicator is attached as explained previously and the milled head rotated until the graduated scale reads 40 pounds. The cock between indicator and cylinder is opened after cutting off the ignition spark from the cylinder.

If the finger H vibrates the sleeve is screwed down until this vibration ceases. The sleeve is then gradually screwed back until the finger commences to show a slight movement.

By placing one's finger lightly on top of the oil tube any movement of the plunger can be easily detected.

The divisions on the casing and sleeve are then read to obtain the pressure in the motor cylinder.

The explosion pressure is obtained by connecting the spark plug and igniting the charge of gas in the cylinder.

As the pressure is liable to be 300 pounds or more it is advisable to screw the sleeve down to this pressure and then to turn it back, in case the finger does not vibrate.

In order to obtain the true compression pressure under load conditions it will be necessary, in the case of an automobile motor, to run with throttle wide open either on the road or by cutting off enough cylinders to prevent racing of the motor and centering the load on the remainder.

The ignition should be in full-advanced position when obtaining the explosion pressure.

When several cylinders are tested it is advisable to carefully mark the throttle position, in order to obtain the same conditions for each cylinder.

When the indicator is used on an automobile motor it will appear as shown in Fig 1. In this case the petcock has been removed and the connection of A, Fig. 1, used.

The writer has found it difficult to use this connection on some cars and so designed the attachment shown in Fig. 4. This can be attached to a priming cock without removing the cock.

Piece A is slipped over the cock shown in X. B is then screwed into the top of A so that the bottom end of it presses tightly over the hole in the cock. The indicator is then screwed into B, making the complete connection from cylinder.

If it is not possible to screw the indicator into B, the fitting C is used instead, and a copper pipe connection made to the indicator which may be clamped to some fixed part of the automobile in a convenient place. Y shows how A, B and X appear when assembled.

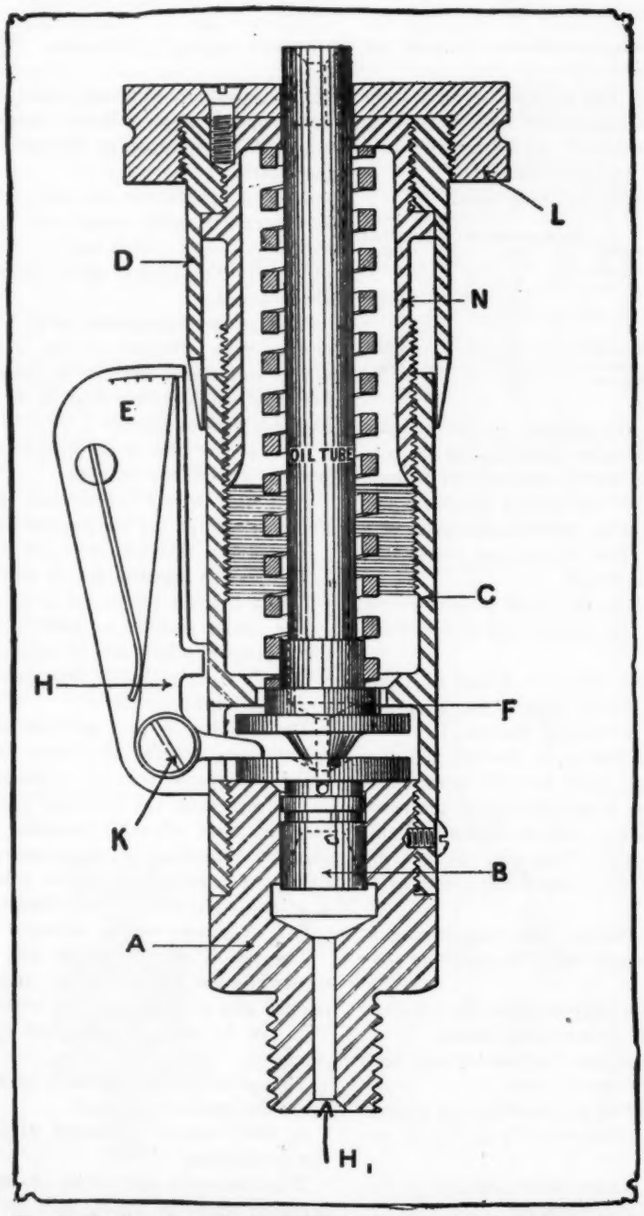


Fig. 2—Section through the O'Kill indicator, showing the method of operation

The best way of indicating a multicylinder motor is to screw the indicator into a manifold from which a pipe runs to each one of the cylinders. By means of a cock at each cylinder it may be instantly connected to the manifold and the pressure can be read on the indicator.

By arranging a cut-out it is easy to cut the ignition off in any cylinder and take the compression reading.

Occasionally the manifold is provided with cocks and located on the dash of a car, which enables readings to be made while running on the road. A falling-off in power of the motor means poor compression and this is instantly shown by the indicator pressure.

The loss of compression may be due to leakage past the piston or the valve seats.

Too rich or too weak a mixture will give a low explosion pressure. Faulty ignition or ignition too much retarded is indicated by a low explosion pressure.

In a car running with wide-open throttle on a slight ascent the writer found the compression pressure to be 50 pounds per square inch and explosion pressure 212 pounds per square inch.

In this case the indicator was placed on one cylinder only and readings had to be taken by an observer seated on the mud guard over the front wheel.

The motor was 48 horsepower, six-cylinders, 4½ by 5½ inches.

Another six-cylinder car of

30 horsepower, tested with wide-open throttle on a slight ascent had a maximum compression of 64 pounds, with maximum explosion pressure of 260 pounds.

The indicator was attached to the dash and piped to one cylinder. Readings could easily be made from the front seat and those given above were the highest observed.

The ignition of the cylinder tested was arranged to be easily cut off by a short-circuiting device operated from the front seat of the car.

These two experiments show the value of higher compression in obtaining increased explosion pressure.

Determination of both of these pressures can be made very easily with this indicator.

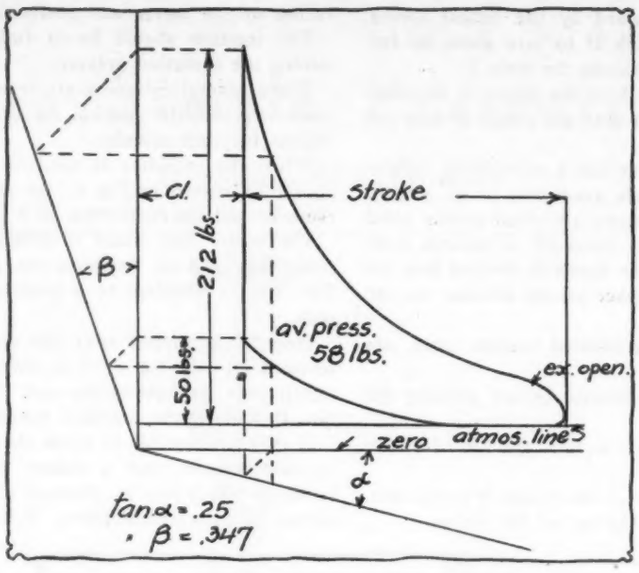


Fig. 3—Indicator diagram for determining engine performance

The writer has made a number of tests to determine the compression and explosion pressures in automobile motors running idle with the car standing still. The throttle, of course, is nearly closed, which accounts for the low pressures obtained.

The following table shows the results of these tests.

Car No.	H.P.	No. Cyls.	Spark	Compression lbs.	Explosion lbs.
1	36	6	Normal	7	6
2	48	6	"	9	8
3	..	4	"	15	12½
4	..	4	"	12	9
5	48	6	"	7	10
5	48	6	Retard	8	8½
5	48	6	Adv.	6½	8½
6	72	6	Normal	6	15
4	60	4	"	11	15

It can be seen by inspection that the pressure in the cylinder at the commencement of the compression stroke must be considerably below atmospheric pressure due to the inability to suck in the charge against the resistance of the closed throttle. The low explosion pressure is probably due to delayed ignition or to a mixture of burned gases with the fresh charge, on account of the exhaust back pressure in the manifold.

The average pressure is very small as the work is done simply in rotating the crankshaft, moving the pistons, connecting-rods, valves, pump and magneto.

An approximate indicator card can easily be drawn by using the above pressures, provided the points where the inlet and exhaust valves open and close are accurately known.

The indicator readings taken with wide-open throttle will give in a similar manner the approximate card for full power, and thus enable the indicated horsepower to be obtained if the revolutions per minute of motor are known. As an example of this take the car numbered 5 in the table. This was the car the compression and explosion of which were noted previously as 50 and 212 pounds respectively.

The motor was 4½ by 5½, six cylinders, and was turning at approximately 600 revolutions per minute when the readings were taken.

The inlet valves opened about 8.5 degrees after the top dead center and closed 47.5 degrees after bottom dead center.

The exhaust valves opened 44 degrees before bottom dead center and closed 4.5 degrees past top dead center.

The clearance volume was assumed to be one-third the volume displaced by the piston movement; therefore C1 in Fig 3 was made one-third of the stroke.

The expansion and compression curves were assumed to follow the same law, namely, $(PV)^{1.33} = \text{constant}$.

They were constructed as shown, laying off α and β by their tangents, as given.

From this indicator card the average pressure was found to be 58 pounds.

As there are six cylinders the power of one cylinder must be multiplied by six.

The area of piston was 15.9 square inches. The stroke was .458 feet.

From this data the indicated horsepower is calculated to be 23.

This is calculated for a car speed of approximately 20 miles per hour, with a 3.3 gear ratio on direct drive.

By the simple reading of the explosion and compression pressures we are thus enabled to calculate the horsepower of a motor running on the road on a slight grade.

If the grade were measured and the coasting resistance of the car as well, the efficiency of the whole mechanism could be calculated for this speed. Other speeds give different results, as regards the power, because of the increase or decrease in revolutions per minute of the motor.

At high speeds the volumetric efficiency reduces the compression pressure, with consequent falling off of average pressure in the cylinders. This can be observed with the pressure indicator and the torque curve of the motor plotted from these observations.

Laboratory experiments with the indicator on multi-cylinder motors show whether or not the cylinders are giving equal power and enable the one at fault to be instantly located. The indicator can also be used as a check on the other indicators used for making cards.

Fittings are shown in Fig. 4, which can be used to advantage as permanent fixtures.

A is used where the cylinder has no opening to connect the indicator except the spark-plug hole.

The plug is then removed and the end a screwed into the hole. The plug is screwed into b and the indicator into c.

B is a bracket connected to two cylinders by the small pipes. The cocks provide a quick connection to these pipes from the indicator, which screws into a.

C is a four-cylinder arrangement provided with manifold, cocks, and cylinder pipes.

The indicator is at a and can be connected to any one of the cylinders by opening the proper cock.

D is an arrangement for a launch having a two-cylinder motor. The pipe from the indicator passes through the bulkhead to a two-way cock where it branches to each cylinder.

A good method of attaching the indicator to a permanent fixture on a cylinder is to use a bayonet joint, as shown in Fig. 4, at the right side of the illustration.

Part A screws on the indicator and fits into part B.

The pin X slips down in groove y and as A is turned it moves the pin along the slot, which is sloping down, thus forcing the end of A against the bottom of the conical hole in B.

It can be instantly detached by rotating A in the opposite direction.

The price of the indicator is $17.50 in England, where it is made and extensively used.

In this country it would probably be about $27, which is not prohibitive.

Manufacturers and users of internal combustion motors can certainly profit by having such an aid in the running and testing of their motors, easy to attach and easy to read as well as being accurate.

Among the New Books

Technical and Non-Technical Works for Both the Layman and the Engineer Recently Announced

THIS is a busy season for the publishers of engineering and kindred works, and it may be said that the reading of such literature is rapidly on the increase and is keeping pace with the development of scientific subjects in the universities. The following list will show some of the latest.

COMPLETE HINTS AND TIPS FOR AUTOMOBILISTS, fifth edition, from *The Autocar*, London, and published by Iliffe & Sons, Ltd., London, England; classified in 500 paragraphs; illustrated; Boards, 2 shillings, 6 pence. (60 cents.)

Given in a series of paragraphs, these tips should come in handy for the man who drives his own car. A comprehensive index renders it possible to find the necessary information with the least possible effort. The index is crossed so that the reader may find the needed paragraph without making two or three guesses at the most important word. These pieces of information are selected from *The Autocar*, only such being picked out as the composers have judged to be of practical value to an amateur only. The methods of making various repairs, of storing a car, driving in risky places, the constituents of various compounds used in automobiling, etc., are all to be found within its pages.

A 5 YEARS' FIGHT AGAINST FIRE WASTE, AND ITS POSSIBLE CONTROL IN THE UNITED STATES BY FIRE PREVENTIONS AND PROTECTION. By Powell Evans. Published by the Merchant & Evans Co., Philadelphia, Pa.; 180, 6 by 9 inch pages. Paper, 25 cents.

The annual waste by fire in the United States amounts to hundreds of millions of dollars. In Philadelphia alone it amounts to $2,500,000 a year, and this is good as compared on a per capita basis with other cities. The annual per capita loss in Philadelphia is $1.65. In the entire United States the average per capita fire loss is $3, or, in other words, $270,000,000 a year is lost in fires in the United States. Boston has the highest per capita loss, amounting to $5.15. As compared with some of the foreign cities, this is tremendous. In Berlin the annual per capita loss is 25 cents, in Paris it is 47 cents, in London, 50 cents. This is a subject which is well worth the study of those interested in economics. Fire protection is not always an expense. In one case where sprinklers were put into a building the price of the installation was saved on the reduction in premium in 2 years. This was on a $1,000,000 policy. The papers contained in this pamphlet are full of interesting facts many of which are brought home in a startling manner.

FAULTS AND HOW TO FIND THEM. By J. S. V. Bickford, B. A., a list of 180 faults, their symptoms and remedies; published by Iliffe & Sons, Ltd., London, England; arranged in 1,190 paragraphs and illustrated. Boards, 2 shillings, 6 pence.

This work attains its maximum value when a knowledge of how to use it is possessed by the reader. There are two indexes, the main index to be used when the fault is known and the cure is wanted, and the secondary index or tables are to be used when the fault is not known but merely the symptoms. At the end of the book there is a list in alphabetical order giving the principal symptoms which, if known, can be referred to directly and thus save the trouble of working through the tables which are arranged in the order of a genealogical tree. The list contains practically every trouble that can possibly be run into on the road and by the aid of the index there should be no trouble in hunting them down. When found, the proper paragraph will give some good, "meaty" advice as to the remedy for the trouble.

A SYNOPSIS OF THE ELEMENTARY THEORY OF HEAT AND HEAT ENGINES. By John Case, B. A., Published by W. Heffer & Sons, Ltd., Cambridge, England, and Simpkin, Marshall & Co., Ltd., London, England. Sixty-five 5 by 8 inch pages. Cloth, 2 shillings, 6 pence.

The student of gas engines should know his thermodynamics as he knows his A. B. C.'s. A knowledge of the laws of gases is absolutely required to design a successful expansion engine, and the same applies to the laws of heat. The problem now in gas engines is to secure a higher thermal efficiency and it is by the path of thermodynamics correctly applied that the conversion of losses into useful work will be accomplished. The gas engine is not a mere mechanical contrivance but it is an instrument for converting the energy contained in gas into useful work. This little work gives some useful problems in thermodynamics and employs some very direct methods in the solution of them.

HOW TO DRIVE A MOTORCYCLE. By Charles S. Lake, author of the *Motorcyclist Handbook*, published by Percival Parshall & Co., London, England, or Spon & Chamberlain, N. Y. Eighty-eight 4.5 by 7 inch pages; illustrated. Paper, 25 cents.

In this little pamphlet full directions regarding the operation and maintenance of a motorcycle are given. It is one of those little works which are of great convenience to a man who first takes up some such pastime as motorcycling, and who wishes to gain more than a superficial knowledge of the subject. Such a book as this is of almost unlimited assistance to the amateur.

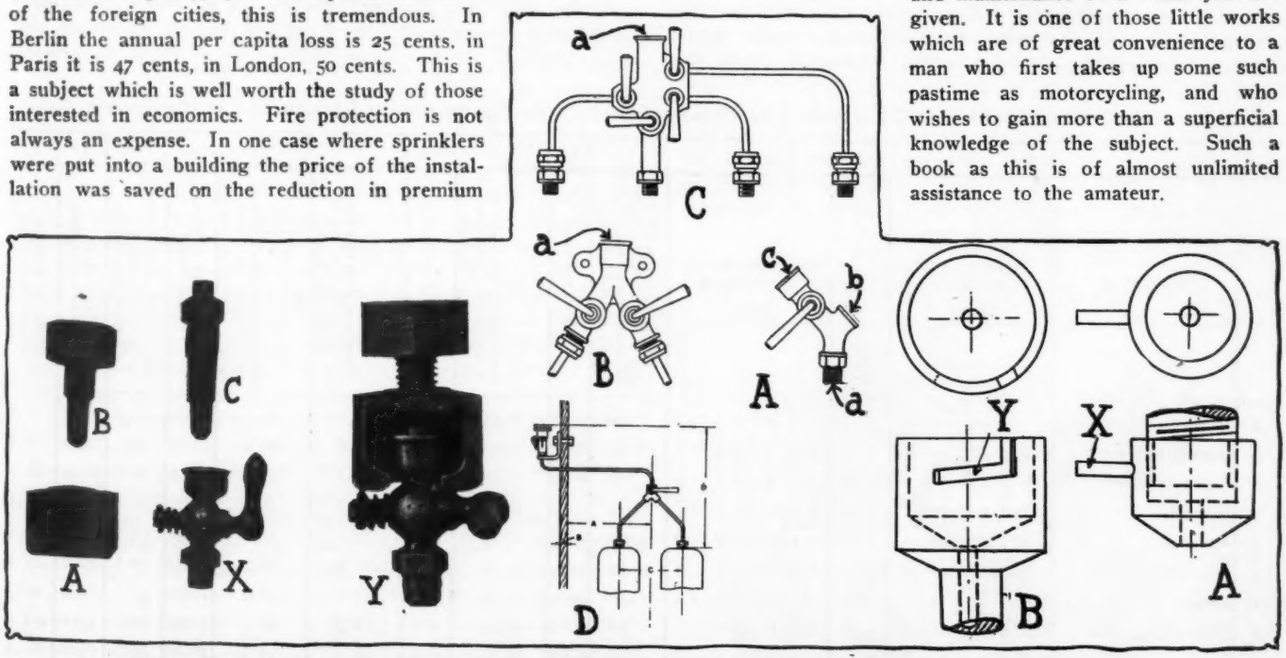


Fig. 4—Fittings used in connection with the O'Kill indicator for dash attachment, manifold attachment, etc.

The Engineering Digest

A Digest of Technical Information from the Engineering Journals

Effects of Taxation Toward Standardizing Small German Cars—Novel Pump Applicable to Automobiles and Fire Engines—Conversion of Cannel Coal into Liquid Motor Fuel

GERMAN 10-Horsepower Cars.—Owners of automobiles in Germany pay a tax of 80 mark (20 dollars) for a car of 10 tax-horsepower and 155 mark for a car of 11 horsepower of the same kind. A tax-horsepower is figured by the formula: $HP = D^2nL \times 0.3$. For this reason nearly all German manufacturers build a model which is sure to come within the 10-tax-horsepower rating. The motors have all four cylinders, excepting the Loreley which has six of 70 millimeters bore and 113 millimeters stroke. Nine out of the 24 four-cylinder cars have 80 bore and 130 stroke. These are the Adler, Apollo, Audi, Benz-Mannheim, Daimler, Komnick, Mathias, Nacke and Windhoff. The one first built in these dimensions was the Daimler-Untertürckheim in 1909. Adler and Windhoff at first built their 10-horsepower motors with 85 bore and 115 stroke but changed to the dimensions mentioned. The Hansa was changed from 85-115 to 80-130, but, curiously enough, the last models—1912 and 1913—are changed to 88-104. Beckmann, Brennabor and Protos have a motor of 82-123, N. A. G. and Phänomen one of 83-120 and Priamus and Opel 84-118. Opel formerly built their 10-horsepower motor with 80 bore and 130 stroke.

Benz-Ladenburg (meaning the cars built by Benz and his sons after the severance of their connection with the large works at Mannheim), Horch, Neckarsulm and Oryx constitute an important group in which the motors are 85-115. The two last ones have been made in these dimensions since 1907. Horch formerly built motors of 85-120, and the reputation of the firm was largely built up on these, but they gave 11 tax-horsepower, and so the stroke was shortened to bring them within the rating. In the Eisenach (87-110), Hansa (88-104) and Ehrhardt (90-100) the stroke is shorter than now ordinarily accepted in automobile motors.

Out of the 24 motors referred to 18, are cast in pairs and 8 in blocks, 9 have water-circulation pumps, while 15 have the thermo-syphon system. Komnick is the only one in which the radiator is behind the motor.

The thermo-syphon system is also employed in some larger German motors; in the Audi-Zwickau up to 22 tax-horsepower, in the Richard-Hering up to 25 and in the Bergmann-Metallurgique up to 29 tax-horsepower.

All the motors, excepting the N. A. G. and the Ehrhardt, which are of the T-type, are made with 1 camshaft. In 18 of them the valves are placed side by side. In 6 of them the inlet valves are of the pendent type; in the Mercedes, Horch and Windhoff these hang directly over the pistons and in the Audi, Komnick and Nacke over the exhaust valves. This is not a matter of fashion but renders it possible to have the combustion chamber of the most favorable compact shape.

The fuel feed is by gravity only in 6 cars; all the others have pressure feed. A still more pronounced standardization is noticed in the clutches, among which only 4 are of the multiple-disk type, all the rest being cone-clutches. All have 4 gear speeds, except Ehrhardt, with 3. Wheel base and gauge are fairly uniform. The longest wheel base, 3.23 meters, is found in the Opel car; the shortest, 2.90 meters, in the Eisenach. The latter also has the narrowest gauge, 1.26 meters, while Ehrhardt has the widest, 1.40.

In the Adler, the Komnick, the Protos and the Horch, tires of different dimensions for the front and the rear wheels are still used, although the contention that narrower front tires make

Gear Reductions, Motor Speeds and Theoretical Fuel Consumption Data for Representative German 10-Tax-Horsepower Cars

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Manufacturer	Gear Reduction Ratio at Speed 1	2	3	4	Reduction in Rear Axle	Total Gear Reduction Ratio at Speed 1	2	3	4	n—Revolutions per Minute of Crankshaft at 60 Kilometers per Hour Car Speed on Direct Gear	h—Stroke, Meters	$\frac{2hn}{60}$ Average Piston Speed at 60 Kilometers per Hour. Meters per Second	d—Bore. Centimeters	$\frac{d^2\pi}{4} \times \frac{2hn}{60}$ Volume of Fuel Gas Consumed at 60 Km. per Hr. Liters per Second	$\frac{d^2\pi}{4} \times 8$ Gas Consumed at 8 Meters per Second of Piston Speed. Liters per Second	Revolutions at 8 Meters Piston Speed	Car Speed at 8 Meters Piston Speed Kilometers per Hour	Piston Area, Square Centimeters	Cylinder Volume, Cubic Centimeters
1	Audi	4	2.28	1.48	1	3.71	14.8	8.5	5.6	3.7	1,480	0.13	6.08	8	30.6	40.2	1,850	75.0	50.3	65.4
2	Benz-Mannheim	4.3	2.26	1.46	1	3.87	16.8	9.0	5.9	3.9	1,560	0.13	6.76	8	34.2	40.2	1,850	71.1	50.3	65.4
3	Benz-Ladenburg	3.7	2.2	1.6	1	3.8	14.1	8.4	6.1	3.8	1,520	0.115	5.49	8.5	31.2	45.4	2,090	82.5	56.8	65.3
4	Daimler	4.26	2.9	1.91	1	4.06	17.2	12.0	7.6	4	1,600	0.13	6.93	8	34.7	40.2	1,850	69.3	50.3	65.4
5	Eisenach	4.35	2.35	1.49	1	4.05	19.8	10.8	6.8	4.5	1,800	0.11	6.60	8.7	39.3	47.2	2,180	72.6	59.5	65.5
6	Komnick	4.16	2.12	1.41	1	3.53	14.7	7.4	4.9	3.5	1,400	0.13	6.06	8	35.8	40.2	1,850	79.2	50.3	65.4
7	Nacke	4.33	2.5	1.72	1	3.44	14.6	8.5	5.8	3.4	1,360	0.13	5.89	8	29.7	40.2	1,850	81.6	50.3	65.4
8	N. A. G.	4.5	2.4	1.56	1	4.28	19.4	10.3	6.9	4.3	1,720	0.12	6.88	8.3	37.3	43.3	2,000	68.7	54.1	64.9
9	Oryx	4.33	2.2	1.6	1	4	17.2	8.9	6.4	4.0	1,600	0.115	6.13	8.5	34.6	45.4	2,090	78.3	56.8	65.3
10	Windhoff	4	2	1.5	1	4	16	8	6	4	1,600	0.13	6.93	8	34.7	40.2	1,850	69.3	50.3	65.4

easy steering only holds good if the steering mechanism is faulty. The author has observed during an experience embracing much long-distance traveling for a number of years that when the tires on front wheels were changed—to take advantage of demountable rims—the broader tires did not affect the steering if the latter was otherwise right, while the car ran more pleasantly by reason of the softer suspension. Among the 20 cars in which front and rear tires are alike, the Benz-Ladenburg has the smallest dimensions, 810-90, and the Benz-Mannheim the largest, 820-120.

Matters relating to the gearing, the speed and the fuel consumption of the cars are exemplified in an appended table, giving the figures for 10 out of the 24. It is seen that the highest and the lowest gear in all the cars come close to the ratio of 1 to 4, while the intermediate gears are less uniform between these limits. As now well understood, the gears should be so chosen as to render it possible to utilize the motor at its best—say between 1200 and 1800 revolutions per minute—for all of them and for as wide a range of car-speeds as possible for each of them, so as to have as few gear changes as practicable. This requirement brings the ideal gear-reduction to 1 for direct, 1.6 for third speed, 2.5 for second speed and 4 for low. But if the reduction for low lies at 4.4, for example, instead of 4, the proportions become 1-1.76-2.75-4.4, and if the reduction for the low gear is only 3.6, the figures become 1-1.44-2.25-3.6. By comparing these ideal proportions with those listed, it is seen that all but Daimler and Benz-Ladenburg are geared too low for the second and third speeds.

The gear reductions in the rear axle range from 3.44 in the Nacke car to 4.5 in the Eisenach. The total reduction, as obtained by multiplying the change-gear reductions with the rear-axle reductions are found in columns 7 to 10 and vary, for the low gear, from 14.1 in the Benz Ladenburg to 19.8 in the Eisenach, while the variation on direct is identical with that given for the rear axle.

The interesting differences with regard to motor speed, car speed and fuel consumption may be studied directly from the subjoined table.—From article by Von Löw in *Automobil-Rundschau,* April 30.

—

MONIN'S Reversible Rotary Pump with Tight Joints—Among the rotary pumps which must be taken into consideration in the future for fire engines, for the water circulation in automobile motors and as a possible element in hydraulic power transmissions, clutches and kindred forms of mechanism, one recently invented by Charles Monin and described with all detail in *l'Ingénieur-Constructeur* for April 15 is based upon an entirely new principle by virtue of which it can support high pressures and high speed while acting as positively as any other piston pump, being in fact a rotary piston pump, like the Von Pittler *Rundlaufpumpe* used in some of the Berlin fire engines. It differs from the latter, however, in being more perfectly positive and therefore more reliable for drawing water from a lower level through an air-filled supply hose, or, in one word, as an evacuation pump. Its movable parts are balanced, this including the members which are only rotary and the two pistons whose movements are at the same time rotary and reciprocating.

Fig. 1 shows a diagrammatic section of this device together with a perspective view of the movable portion and, underneath, five consecutive positions of one of the pistons in relation to its rotary housing. The cylindrical casing B is closed in front and rear by two plates and is connected with the suction pipe A on one side and the discharge pipe R on the other. The body M can turn in the bore C of this casing and is formed with a recess across each of its faces, one at a right angle to the other, and in these recesses the two piston-blocks C and D, which are similar, can slide. The driving-shaft O passes eccentrically through the face-plates of the casing and through the middle of both piston-blocks but is formed in one piece with two eccentric enlargements extending in diametrically opposite directions and each constituting a cylindrical bearing for one of the piston-blocks.

When turning, the driving-shaft turns with it the two blocks and the body M, the lower portion of the illustration showing the positions successively taken up by the front piston-block and the body M during one turn of the shaft. It is noticed that the water is at first drawn in by the lower face of the piston and discharged by the upper. Then, as the parts are turned further around, in the direction indicated by arrows, the suction takes place at the left side and the discharge at the right. In the continuance of its rotary and also reciprocating movement the piston draws in water at the upper left and discharges at the lower right and then returns to its starting position—with the piston reversed, however. The piston and the body M thus make one-half of a turn when the shaft makes a full turn. The other piston effects a similar movement, following 90 degrees behind the first one. No valves being required, the operation is automatic without any other movable parts. The mechanism is reversible; that is, by changing the direction of the shaft-movement the flow of the water is reversed, and the supply and discharge pipes exchange functions. The possibility of operating this pump at very high speed without troublesome vibrations imparts to it a high capacity for its weight and size.—From *Le Génie Civil,* May 10.

—

BRITAIN'S Struggle to Evolve New Liquid Motor Fuels—It has long been the aim in English motor circles to emancipate the tight little isle from dependence upon imported gasoline and gasoline made from imported crude oil. A certain secretiveness, which apparently may be traced to the desire of patentees and promoters for securing an ample return for their labors and which has cropped out in the form of ambiguous or inconclusive statements of the results obtained, as well as in charges, countercharges and insinuations, is keeping the exact status of recent developments in this respect somewhat under cover. But it is known that one or two processes for extracting a liquid motor fuel direct from coal are under way and have advanced to such a point of feasibility as to place all older plans for utilizing alcohol or benzol completely in the shade for the present. While the new distillate from coal is frequently designated as benzol, it is not the benzol which has heretofore been turned out as a by-product of cokeries and gas works but a new liquid hydrocarbon resembling gasoline more than benzol in chemical composition and one which, unlike the real benzol, may be produced in practically unlimited quantity from poor grades of coal and from certain grades of shale.

It does not yet seem certain whether the product derived from coal differs materially from that derived from bituminous shale, especially as the coal preferred as raw material in England is shale-like in structure, while parallel experiments in France are directed upon the utilization of the shale there abounding.

A contributor to *The Motor,* a British journal which has been prominent in agitating the movement and describing the processes

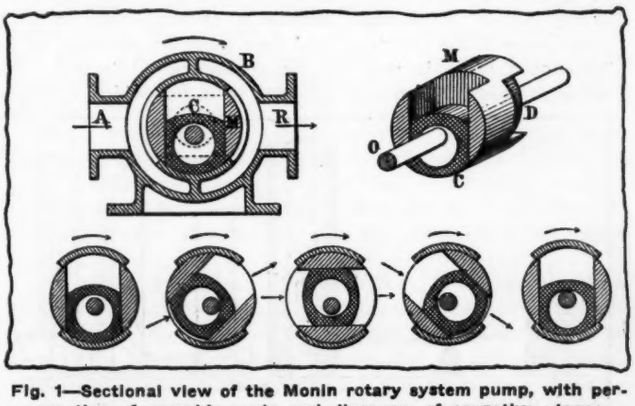


Fig. 1—Sectional view of the Monin rotary system pump, with perspective of movable parts and diagrams of operative stages

involved, summarizes the situation in the issue of May 13, as follows: "We are probably only at the beginning of a vitally important movement in the preparation of motor spirit from coal. But whatever process is arrived at, it is absolutely certain that there will be a considerable number of by-products, and on the profitable sale of these will depend the commercial success of the whole undertaking." The same contributer proposes the name of coalol for the new product so as to distinguish it sharply from benzol. The fact that benzol is a by-product in the utilization of valuable materials, while the coal distillate is a main product from fresh raw materials heretofore considered as of very low value and that the process of distilling it creates new by-products from these cheap materials, perhaps of greater value than any which the raw materials were supposed to contain, apart from the value of the new main product, evidently establishes a contrast which warrants the search for a new name. [The name of coalol, however, does not seem very acceptable from any point of view, being of hybrid derivation, too close to "coal oil" in sound, and lacking in the vigorous individuality always eventually wanted for an important article intended for popular consumption. Perhaps "canneline" would come nearer to the requirements, in view of the derivation of the new fuel from "cannel coal."—ED.]

The process for converting coal into motor fuel, plus by-products, of which most details have become known is one identified with the name of Del Monte as inventor. With special reference to the results of this process, the authority quoted above states that the products gained by the decomposition of the coal range as follows in market value: (1) Solid fuel similar to coke, 56 per cent.; (2) gas, which may be sold or used as fuel in the cycle of the distillation itself, the quantity not yet determined; (3) motor fuel 20 per cent.; (4) heavier oils .04 per cent.; (5) sulphate of ammonia 10 per cent. and (6) tar or pitch 8 per cent.

From this accounting it is plain that the motoring public will buy only $20 worth out of every $100 worth of product brought into existence by the contemplated new enterprise, and that consequently the public in general must be relied upon for finding suitable uses for the rest of the production. Assuming that the minor products may be readily disposed of, the great commercial problem which must be solved before the motoring public can get the benefit of the "coalol" [or "canneline"] is therefore to stimulate the at present languishing demand for a smokeless coke-like fuel for domestic or industrial purposes.

Another great difficulty to be overcome, it is stated, lies in the transportation problem of the new materials which is hedged with legal provisions said to favor prospective competitors.

The nature of the Del Monte process is described in *Omnia* of April 12 by J. Marsillac, a French observer who was present at some of the tests which have been conducted in a semi-public manner. According to his account, the motorists of the British islands consume at present more than 400 million liters of gasoline per year, and the Del Monte process promises to satisfy all of this demand, because it extracts from 20 to 30 times more liquid fuel from coal than could be extracted by the established methods used in the production of benzol. The latter is made by placing the coal in a vat which is heated from the outside to about 1,000 degrees Centigrade. Illuminating-gas and a whole series of volatile products are in this manner driven out, and the volatile products are successively condensed. From one of them the benzol is obtained by refinement. The residue in the vat is the ordinary coke employed for different heating purposes. The system of heating from the outside alone entails a great waste and a lack of uniformity in the products, as those coming from the interior of the heated mass have not been subjected to nearly as much heat as those coming from near the walls. By the Del Monte method the temperatures imparted to the coal rise nowhere much above 500 degrees but are applied in the interior as well as to the exterior of the mass of treated material. The operation is a cycle in which the products of the distillation at one stage in the process are utilized for the other stages. The apparatuses used are placed in a circle and connected, so that the operation becomes nearly automatic and wholly continuous. Fig. 2 represents the different parts as placed in a row, for the sake of clearness, but in reality the pipes X and F are connected. With reference to the illustration, the plant comprises (1) a gasometer, (2) a compressor pump, (3) a retort of special construction, (4) a condenser with drain pipe at J and (5 and 6) two scrubbers, or combined washers and condensers of gases. The retort is composed of a metallic receptacle slightly conical, with the taper toward the top, where a gate may be opened for the reception of coal from an automatic charging apparatus and hopper. At the bottom another gate serves for the removal of the coke. At about one-third of the height of this retort, a pipe from the compressor-pump enters through the side of the surrounding wall, carrying gas under slight compression. This gas is at the start ordinary illuminating-gas, with which the gasometer is charged, but subsequently the gases generated by the process take its place. The pipe follows a serpentine course to the bottom of the retort where it enters the latter. It is heated externally by means of Bunsen burners, the arrangement of which may be readily imagined, and the retort naturally receives a great deal of heat from the same source. The pipe and the gas contained in it is raised to a temperature of about 800 degrees, and when this hot gas is discharged at the bottom of the coal it rises rapidly heating the coal uniformly. All the gaseous products driven out of the coal, and among them those containing the new motor fuel, rise to the top of the retort and from there reach the condenser (4), from which some of those with the highest flashing point are drained. The others continue their course to parts 5 and 6, where they are "scrubbed" and liquefied. Only a few non-condensable gases are returned to the gasometer, from which they are sent out in the circuit again as heat producers.

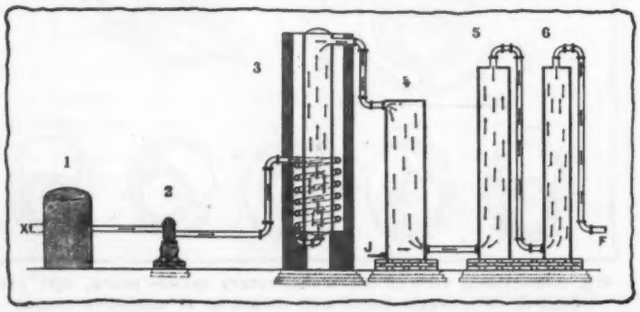


Fig. 2—Sketch of Del Monte plant for producing liquid motor fuel from cannel coal and other inexpensive materials

Among the different sorts of coal which may be used in this plant the variety known as cannel coal gives the best economical results. It looks like very dark shale but is rich in the constituents formerly desired for illuminating gas. But it has now been abandoned for this purpose in favor of other coals of higher caloric value. Its combustion in fireplaces develops smoke and odors which render it undesirable as a domestic fuel. For these reasons the price of it has dropped to $1.25 per ton, and large deposits of it are available in Scotland. From a ton of this material the Del Monte process produces 200 liters of motor fuel in some instances. The estimates mentioned in connection with the projected enterprises are much lower, however, the probable price of the coal being placed at about $3.25 and the output of motor fuel per ton of material at 40 to 60 liters, whereto comes 700 to 800 kilograms of coke which burns with a clear and smokeless flame, 14 to 20 kilograms of sulphate of ammonia and up to 200 cubic meters of gas.

The flashing point of the new fuel varies from 50 to 150 degrees C., while that of benzol varies from 80 to 110 degrees and that of gasoline from 47 to 110 degrees. The specific gravity is 746 at 14 degrees C. The product does not attack or foul cylinders or pistons, and a motor may be started with it as easily as with gasoline.

The Engineers' Forum

Gearbox Location

Which?

Part V

Positive Alignment of Gearbox and Engine Argument for Unit Motor

THIS week appears the opinion of one of the few engineers whose views on the subject of gearbox location have not been published in THE AUTOMOBILE to date. Another engineer writes regarding stock car racing and its effect on the public and a third gives his ideas on the subject of horsepower rating.

Unit Type with Three-Point Motor Suspension—Klinger

DAYTON, O.—Editor THE AUTOMOBILE:—With reference to our opinion of proper location of gearbox, we are very pronounced in our preference for three-point suspension of the motor with a unit gearbox. This insures a positive alignment of gearbox and engine, not only in the assembly of the car, but also the maintenance of this alignment in years of service. It also makes it possible to absolutely inclose the clutch and operating parts, making it possible to lubricate them properly and exclude dust and dirt, thereby largely eliminating the wear and tear.

This location of the gearbox also eliminates a number of parts, such as rods, levers and pins which are necessary with the amidship location as well as rear-axle location, and the elimination of parts on an automobile usually means a decided step toward the elimination of trouble and expense as well as weight.

The unit plant certainly is much more accessible than the rear-axle plant and equally as accessible as the mid-ship location. While trouble does not often arise with gearset these days, yet were one to attempt to look into the gear of a rear-axle transmission on the road he would be quickly convinced that either the mid-ship or the unit plant is much more desirable location. It is necessary to inspect these gearsets occasionally to see that they are oiled, and we believe the rear-axle location is not nearly so likely to receive attention as unit or amidship. Each day's experience with the unit power plant only tends to confirm our very decided preference for it.—P. W. KLINGER, Chief Engineer, Speedwell Motor Car Co.

Stock Cars Are Not Fit for Racing Purposes—Porter

TRENTON, N. J.—Editor THE AUTOMOBILE:—I note in a recent issue of THE AUTOMOBILE that the stock car racing bee is at large and has evidently stung a few people. The different opinions expressed as to the value of this type of racing is, to my mind, offered without a perfect analysis being made as to the conditions involved. I wish to appeal to you to use every possible effort through the columns of your paper in an endeavor to stop this question gaining any momentum at this time. To my mind, this is one of the greatest impositions ever perpetrated on the public and it surely gives the manufacturers a great amount of trouble from which they get no return whatever.

The several expressed advantages for stock car racing do not express at all clearly the real facts governing the situation. In the first place, a stock car is not fit for a race nor is a racing car fit for stock use. Then, besides, it seems so unreasonable for any reputable firm to be parading its wares in front of the public, shouting continually that they are honest goods. My impression is that this is a position that should be at least assumed by all manufacturers of standing and one that is, I believe, conceded by the public, or, at least, should be. There is no real reason why the manufacturers should not incorporate in any stock car their most earnest and honest efforts to produce a product free of trouble, especially since it is much cheaper to make one's product good in the beginning, than it is to maintain an expensive and elaborate road department in order to keep the car running. I believe the public thoroughly understands this and when any firm can demonstrate its ability by producing a speed creation capable of record-breaking performances it is reasonable to suppose that the experience gained will be used to better the stock production. Besides, the general principles are involved just as much in racing machines as they are in stock cars. The basic principles are the only ones at stake in either of them. Consequently, my impression is that when you find a man howling about stock car racing you will have one not capable of producing a speed creation. In other words, he knows his production is not what it should be, but he wants to try to convince the people that it is. No purely stock car ever won a race or ever will as long as the conditions involved are so entirely different from those demanded in stock car use.

Aside from the reasons given above, it is almost impossible to promote a stock car race, as the public is not at all interested in any competition unless its very nature promotes thrills beyond the possibility of a stock car. This fact alone leads to all sorts of inducements being offered to swell an entry list and necessarily permits the entry of a great many cars not at all fit for the purpose, which only makes a farce out of the proposition.

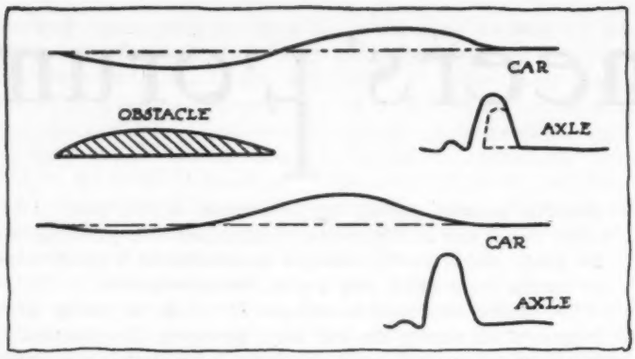
In view of the conditions involved, I urge upon you the necessity of opening and keeping open a thorough discussion of these points, so that it will be kept continually before the public.—FINLEY R. PORTER, Engineer, Mercer Automobile Co.

Manufacturer Could Give Both S. A. E. and Own Rating

EAST MOLINE, ILL.—Editor THE AUTOMOBILE:—The manufacturer of a long-stroke motor has been forced to give actual horsepower rating and not the A. L. A. M. rating on account of the fact that he is not getting any credit for the gain in the longer stroke against the manufacturer that is putting out a shorter-stroke motor.

On the other hand, the manufacturer of the long-stroke motor will, as a rule, gear his car high enough to work only with a modern engine speed on the average road, consequently the power developed will not be any greater than the power developed by the short-stroke engine at the same car speed but higher engine speed.

We believe that the A. L. A. M. or S. A. E. ratings should not be abolished, but the manufacturer could, perhaps, give the public both ratings; the rating of the standard formula as well as the rate of the actual average horsepower that the motor is capable to develop. This is the practice of many European manufacturers. They will give the tax rating and the actual rating.—E. GRUENEWALD, Moline Automobile Co.



Figs. 1 and 2—Sample records made by model car, the obstacle being a bent piece of thin steel of the actual shape shown

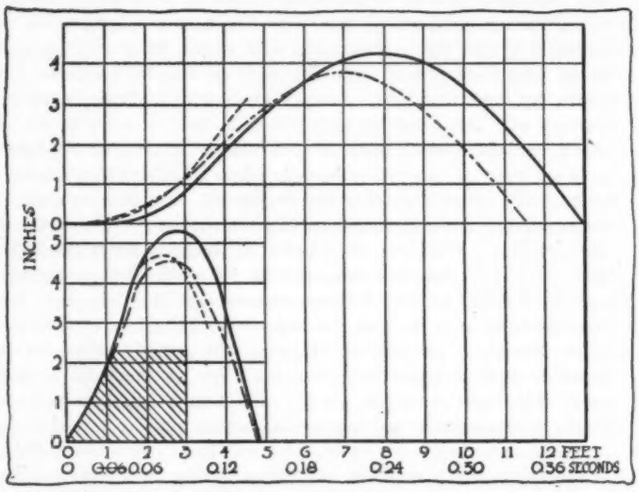


Fig. 3—Showing in full-line curves the motions of the axle and car with no friction. Note how closely the curves agree with those obtained by the use of the model

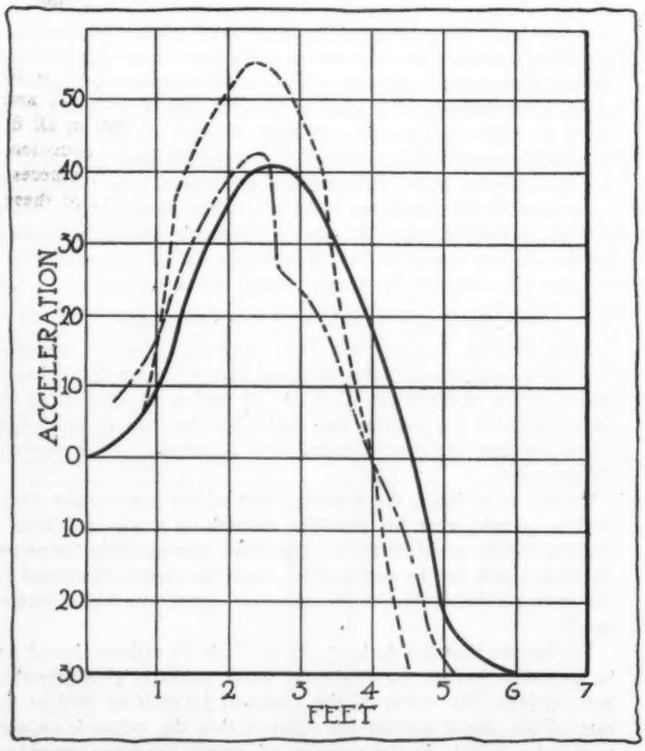


Fig. 4—Full-line curve is acceleration curve of the car. Broken lines are the same except that the spring is stronger by 100 pounds than that shown in the full-line curve

Defects in Springs

Use of Shock-Absorbers Indicates That Present Construction Leaves Much To Be Desired in Comfort

From a Paper Read Before the Institution of Automobile Engineers by G. H. Baillee

AUTOMOBILE springs have received less attention from those who talk and write than any other part of the car. I do not know whether those who do things have been equally neglectful, but they have been remarkably silent about what they have done. A hunt through the automobile literature has shown practically nothing of interest, apart from the question of the qualities of steel suitable for springs. An examination of the practice in cars now on the market shows that, with two or three exceptions, all springs are of the same pattern, neglecting differences too subtle for the ordinary observer. The most notable exception is due to the man who has introduced more novelties into motor cars than anyone else, and, unlike most other novelists, has introduced successful novelties.

I was first induced to commence investigations on the subject of springs by owning a car which was peculiarly uncomfortable to ride in. The next impulse towards an endeavor to find out something about springs was the rage for auxiliary springs and shock-absorbers. At the present time it is rare to see a car without a fitting of this kind, a fitting not belonging to the car but stuck on to it. Now, unless it is assumed that the utility of all these things is entirely imaginary, their existence is a grave reflection on chassis builders; it means that the makers have not done their best in springing the chassis, and have left room for improvement, and if any improvement can be effected by an owner by casually putting on the first contraption he sees advertised it means that the room for improvement must be very large.

Springs Are Now Most Important Feature

Some makers certainly have given a great deal of thought to their springs, and the results can be felt in their cars; but the author knows others, and he believes their number to be large, who do not give the springs anything approaching the attention they deserve. Now that cars have given up breaking down, I consider their springing the most important feature. It is only necessary to run for a few hundred miles over a flat, dull and bumpy road to realize how much the pleasure of the trip depends on the springs.

And something more than comfort depends on it. The author believes that tires are more affected by the action of the springs than by anything else, both as regards wear and bursting.

I started by constructing a model car to one-eighth linear scale, having wheels with solid rubber tires. For convenience I made the road move under the car, the road consisting of a strip of webbing 12 feet long, passing round a motor pulley and an idle pulley. The webbing ran over a board where the car rested on it. After trying a front and back wheel, I discarded the front wheel and retained only a single wheel on the end of an axle pivoted some way back, so that the wheel had an approximately vertical motion.

Fig. 9 shows the arrangement of the model and its equipment after the second wheel had been removed.

To the axle was fixed the lower leaf of a double elliptical spring made of two single pieces of clock spring, the upper leaf being fixed to a framework and also pivoted some way back.

The framework, which represented the spring portion of the car, had provision for carrying load. Pencils were fitted to the car and to the axle and recorded on a moving strip of paper.

Obstacles of different kinds were attached to the road, and frictional devices were attached between the axle and the car.

Figs. 1 and 2 show two sample records, the obstacles being a bent piece of thin steel of the actual shape shown. According to the linear scale of the car, the obstacle would be 2 inches high to a full-sized car.

It will be noticed that the wheel jumped above the obstacle in each case and came to the ground beyond the obstacle, and the shape of the obstacle appeared to make no appreciable difference unless its slope was very gentle.

It will also be noticed that the wheel reaches the top of its path before the car has moved appreciably, and by the time it has returned to level ground the car has completed only some 40 per cent. of its upward path.

In Fig. 1 no friction was introduced to damp the oscillations, the amount of damping being actually about the same as that which exists in an ordinary leaf spring. In Fig. 2, in which the track speed was about double, friction was introduced, and the damping effect is very noticeable in the rebound of the car.

No Difference in First Half Oscillation

Now, examination of a considerable number of records, without friction, with constant friction and with friction increasing with the amplitude, showed no appreciable difference in the first half oscillation of the car, and in this respect the model car was most disappointing. It became clear, in fact, that the difference lay in the initial movement of the car, while the axle was rising, and, in the model records, this part of the curves was on too small a scale to admit of accurate examination.

I then reckoned out the motions of the axle and the car on meeting an obstacle, making certain assumptions in respect to the obstacle to circumvent the difficulties which arise while the tire is "drinking the obstacle." The resulting curves are, as far as comparison is possible, of the same type as those given by the model, and this leads him to hope that the calculated curves do show what actually happens.

Fig. 3 shows in full line curves the motions of the axle and the car with no friction, and it may be noted how closely the curves agree with those from the model.

The assumption made in regard to the obstacle was that it was of a shape to give a constant pressure on the tire, and the pressure assumed was that required to flatten the tire till 40 square inches of tire with 85 pounds of air pressure were in contact with the obstacle. This is approximately what happens with a large section tire. The obstacle is 2.25 inches high and the tire is in contact with it for 14 1-2 inches. The author assumed a car with 750 pounds sprung weight per back wheel and 250 pounds unsprung weight, including the weight of the spring, a spring deflecting 1 inch per 200 pounds, and a velocity of 22.5 miles per hour.

It had to be assumed that the tire left the top edge of the obstacle suddenly, and released the pressure suddenly, but this point does not show any break of continuity on the curves in Fig. 3. The abscissæ of the curves are feet of travel of the car and the ordinates inches of rise. It has been assumed that there is no rebound of the axle from the road.

Now, the path of the car, as shown in the curves, is not really of much importance. So long as the maximum movement does not pass the limit reluctantly allowed by the coachbuilder, a large swing causes no discomfort merely because it is large. In crossing a humped bridge at just the right speed, there is often a very big swing with a gentle switchback movement and no sign of a jerk.

The full line curve in Fig. 4 is the acceleration curve of the car, corresponding to the curve of path in Fig. 3, the curve being plotted from the calculated figures, and not deduced from the curve of path. In this figure the abscissæ are feet of travel, as before, and the ordinates accelerations, those above zero being upward accelerations. The maximum upward acceleration is reached just before the axle reaches the top of its path, and the acceleration changes sign just before the axle returns

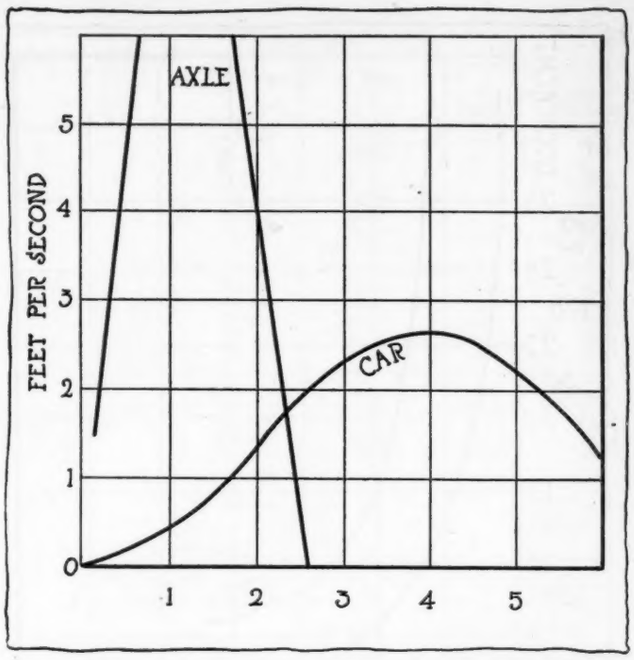


Fig. 5—Enlarged curve, showing comparatively the motion of the car and axle in passing over an obstacle

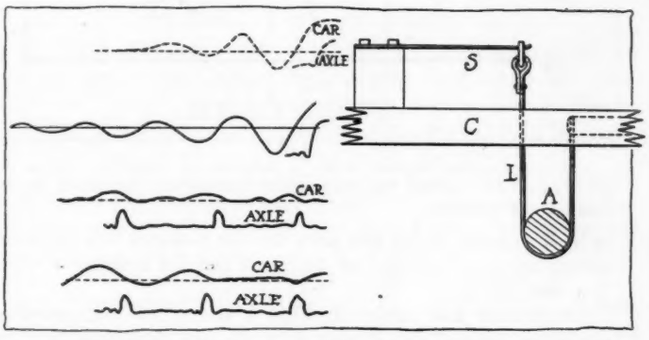


Fig. 6—(Upper left), two graphs of a 15/16-inch drop of the car fitted with the friction device and with the road stationary. Fig. 7— (Lower left), two graphs with the road running and three obstacles at equal distances. Fig. 8—(Right), special friction device fitted to model car in which the friction element consists of a leather band acting against the axle on the rebound when the axle passes beyond its normal position

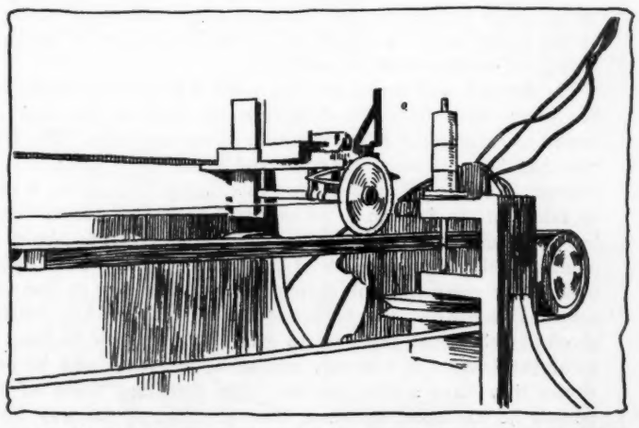


Fig. 9—Model car, constructed to one-eighth linear scale, and roadbed formed by belt running on pulleys actuated by an electric motor. An obstacle is shown at the middle of the upper part of the belt. In the operation of the device, the wheel and the axle are stationary, the moving roadbed imparting the shocks recorded through the spring

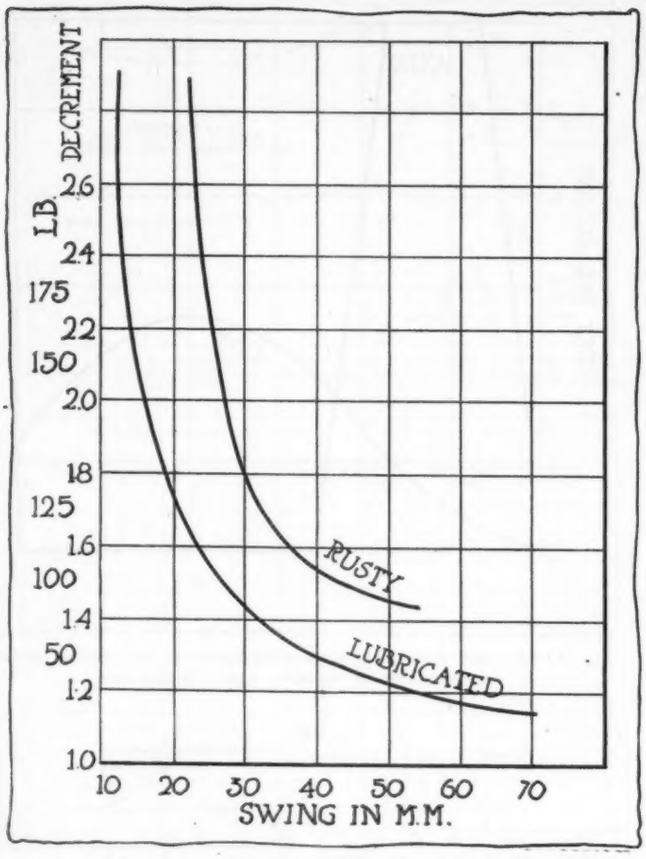


Fig. 10—Curves plotted from a number of records. It is remarkable how rapidly the decrement (ordinates) increases as the oscillations decrease

to level ground. After this point the car executes free harmonic motion up and to the end of its travel, and the aceleration curve is a sine curve.

The broken line curves in Figs. 3 and 4 are corresponding curves to the full line curves, with the one difference that the strength of the spring is 300 pounds per inch instead of 200 pounds. The whole movement is over sooner, but otherwise there is little difference to be seen in the curves of path. Turning, however, to the acceleration curve, this, at the corresponding point, is markedly steeper. The maximum inclination is 48 ordinate per unit abscissa, or 50 per cent. more than with the weaker spring. The inclination is in the same proportion as the strength of the spring, and this clearly shows the importance of having a spring no stronger than is necessary.

The dot and dash curves in Figs. 3 and 4 correspond to the full line curve, with the single difference that friction has been assumed to exist in the relative motion of car and axle. The friction has been assumed constant and equal to a force of 170 pounds. To give an idea of what this means in practice, it may be said that the friction in an ordinary seven-leaf spring tested by the author was, when clean and well greased, about 50 pounds, and when rusty about 85 pounds, these values being obtained by measuring the decrements, which were 1.24 and 1.45 respectively. Now, the author does not know what friction shock-absorbers are supposed to give. After a few months on a car the friction is generally negligible, but when new he presumes they have a fair amount. The frictional force of 170 pounds he has assumed is not, therefore, out of the way for a spring in average condition fitted with a shock-absorber.

The fluid friction device appears to be an excellent thing, and the only trouble about it is that, as far as I know, it will not work in practice.

The other kind of friction device is that which comes into action only on the rebound. My assistant, Mr. Gregory, designed a very ingenious form of this, which he fitted on the model car. It is shown in Fig. 8, in which A is the axle, C the car and L a leather strip fixed to the car at one end, passing under the axle and hanging at the other end on a spring S, fixed to the car. In the normal position of the spring, the leather band is quite free, the spring S exerting no force on it. Therefore, for any compression of the spring from its normal position no friction is introduced. On the rebound, however, as the axle passes beyond its normal position, it comes against the leather band, which rubs round it with pressure increasing with the rebound deflection.

Fig. 6 shows two graphs of the model car fitted with this device taken with the road stationary, merely by dropping the car through 15-16 inch. The lower graph represents the undamped swings, the upper graph shows the result obtained with the leather band.

Fig. 7 shows two graphs taken with the road running and with three obstacles at equal distances, the speed being adjusted to make the effect of the obstacles cumulative. As before, the lower graph represents the undamped swings and the upper graph the effect of the leather band.

I will now mention some tests made on a motor car spring which was very kindly lent to me by the Wolseley Co. It was a light spring, deflecting 1 inch with about 135 pounds, and was 49 inches long, and had seven leaves. This was hung by its ends on two long shackles, and a platform was hung from its center to take weights. Weights up to 690 pounds deflected the spring till it was nearly flat, the height above the chord being only 16 millimeters. A pencil attached to the center of the spring recorded on a drum. The spring was made to oscillate by hand, and at the moment the hand was removed the pencil was put in contact with the drum upon which the records were taken.

For the first tests the spring was cleaned and well greased, and then the grease was thoroughly cleaned off and strong sal ammoniac put between the leaves, with the result that in a day the spring was as rusty as the ordinary motor car spring generally is.

From the graphs obtained, the decrement was measured as the ratio of one half-oscillation to the next half-oscillation. The ratio of the positive amplitude to the negative was not taken because the zero position, owing to friction, was not quite definite. Fig. 10 shows curves plotted from a number of records, the abscissæ being the total amplitude, plus to minus, of the first half-oscillation from which the decrement (ordinates) was reckoned. It is rather remarkable how rapidly the decrement increases as the oscillations get small.

To gain an idea of what the decrement means in friction, the average frictional force over a swing was calculated by equating the loss of energy in the system over a whole oscillation to the work done by the movement of the center of the spring. The frictional force so calculated would be that in a friction device attached to the center of the spring if the spring itself were without friction. The second scale of ordinates gives this force in pounds. The difference between the two conditions of the same spring is very striking, especially when it is remembered that the deflections are small ones in a nearly flat spring. Thus, for a total swing of 24 millimeters the frictional force is 100 pounds in the lubricated spring and 175 in the rusty one. For a larger swing of 54 millimeters they are 46 and 83 pounds respectively.

It would be interesting to ascertain the difference in friction between a flat spring and a highly cambered spring, but it would mean the construction of a number of different springs. I took a number of graphs with a weight of about 380 pounds with which the height of the chord was 80 millimeters instead of 16 millimeters with 690 pounds. The resulting curve is of the same shape as those in Fig. 9, but the decrements are lower. For a swing of 30 millimeters, with lubricated spring, the decrements are 1.253 and 1.420 for 380 and 690 pounds, respectively. I do not think, though, that any deduction can be made from these results to give an indication of the difference in friction due to camber only.

Benzol Beats Gasoline in Economy Test

Trials with Favorit Carbureter on Brooklands Show Saving of 17 Per Cent. in Miles Per Gallon

Economy of Benzol Was Particularly Noticeable at Low Speeds, Giving 33 Miles to the Gallon as Compared to 26 Miles with Gasoline

LONDON, ENG., May 20—Benzol gives better fuel economy than gasoline, according to the reports on the Favorit carbureter just given out by the Royal Automobile Club and published in the *Journal* of that institution. The carbureter was fitted to a Benz 28-35-horsepower car and the trials were held on Brooklands track. The speed of the car was noted and the amount of fuel consumed recorded in terms of miles per gallon. An average of the tests showed that the benzol was 17 per cent. more economical in miles per gallon than the gasoline. The difference in economy was particularly noticeable at low speeds, as may be seen from the tables, where the car attained a mileage of over 33 miles to the gallon on benzol as compared to 26 miles per gallon for gasoline. The full report as given by the R. A. C. is as follows:

This is to Certify that a Favorit carbureter was entered for trial by Messrs. Favorit Vergasergesellschaft m. b. H., of Berlin, and 14 Caxton House, London, S. W.

Description of Carbureter—The carbureter is of the usual form, with float chamber and mixing chamber. There are two sources of fuel supply to the engine: (*a*) The usual central jet (which is adjustable by a taper needle); (*b*) a by-pass entering the induction pipe at the point at which the lip of the butterfly throttle touches. In addition, air is admitted to the engine through the throttle spindle when the throttle is completely closed and the engine not firing.

Description of Trial—The carbureter was fitted to a 28-35 horsepower (22.4 R. A. C. rating) Benz car. The carbureter was warmed by the engine cooling water. The particulars of the car were as follows:

Engine, four cylinders	95 mm. by 140 mm.
Volume of the compression space of a cylinder	293 c.c.
Volume swept by the piston	1.991 c.c.
Compression ratio	4.3
Weight of car	3,626 lb. (32 cwt. approx.)
Weight of car and load as run	4,181 lb. (37½ cwt. approx.)
Gear ratio on top gear	3.25 to 1
Size of wheels	880 mm.
Wind area of body	14.0 square feet
Country of origin of carbureter	Germany

The trials were held upon Brooklands track. The weather for Tests 1 to 7 and 13 to 17 was fine, cold and windy, while there was rain during 8 to 12.

Benzol was used in Tests 1 to 12, the following being the result of a distillation test of a sample:

First drop distilled at	75 ° C.
10 per cent. distilled at	84.5° C.
20 per cent. distilled at	85 ° C.
30 per cent. distilled at	86 ° C.
40 per cent. distilled at	87 ° C.
50 per cent. distilled at	88 ° C.
60 per cent. distilled at	89 ° C.
70 per cent. distilled at	91.5° C.
80 per cent. distilled at	94.5° C.
90 per cent. distilled at	103.5° C.

The specific gravity of the fuel, which was 0.873 at 15.5 degrees Centigrade, may indicate the presence of an extremely small quantity of gasoline, so small as probably to be caused by imperfect draining of the tank and pipes prior to filling up with the benzol.

After Tests 1 to 7 the carbureter was adjusted and the valves of the engine ground in. No adjustment or alteration was made between the tests in which benzol was used and those in which gasoline was used.

SUMMARY OF TESTS

No. of test	Fuel used	Speed, m.p.h.	Consumption: Miles per gallon	Consumption: Ton miles per gallon
1	Benzol	13.17	19.5	36.4
2	Benzol	18.85	19.5	36.4
3	Benzol	25.99	18.77	35.03
4	Benzol	31.41	17.55	32.75
5	Benzol	38.45	17.55	32.75
6	Benzol	44.02	17.55	32.75
7	Benzol	48.79 (Maximum)	15.59	29.09
(The carbureter was then adjusted)				
8	Benzol	13.35	33.40	62.34
9	Benzol	19.31	30.44	56.82
10	Benzol	25.10	28.63	53.44
11	Benzol	31.12	26.52	49.51
12	Benzol	37.17	21.67	40.44
(Higher speeds were not attempted by the entrant)				
13	Gasoline	13.53	26.57	49.60
14	Gasoline	19.21	25.30	47.22
15	Gasoline	25.21	23.93	44.67
16	Gasoline	32.01	22.36	41.74
17	Gasoline	36.45	20.68	38.60
(Higher speeds were not attempted by the entrant)				

NOTE.—The speeds are average speeds, but were kept as constant as possible during each test.

J. W. ORDE, *Secretary.*
April 29, 1913.
Pall Mall, London, S. W.

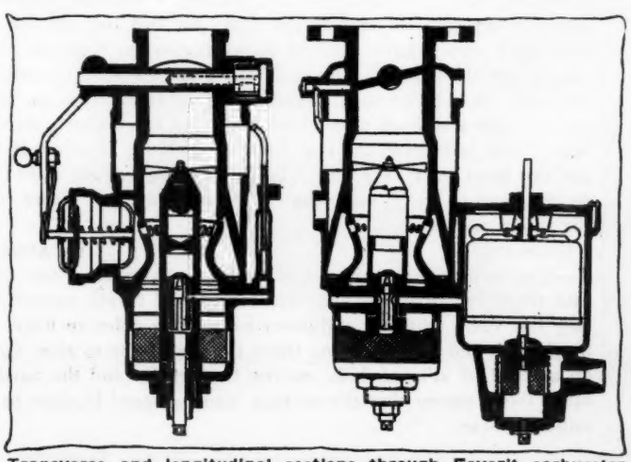
ARTHUR STANLEY, *Chairman.*
W. WATSON, *Vice-Chairman of Technical Committee.*

R.A.C. Tests on Globe Car

LONDON, ENGLAND, May 20—Reports just published by the Royal Automobile Club on the tests of a Globe car on the roads between Russell Court and Bow Road, London, for the purpose of determining the performance of the car under traffic conditions, show English car performance on high gear.

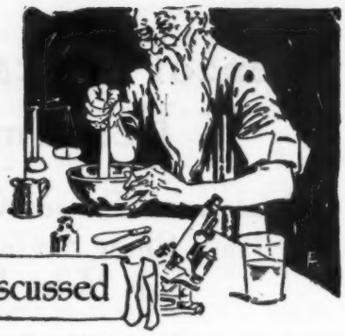
The car weighed 1,300 pounds in running condition and was equipped with a two-passenger body. The motor was of French manufacture with a bore of 4.13 inches and a stroke of 4.72 inches, has one cylinder and has a gear ratio of 4 to 1 on high. The route followed was between Russell Court, St. James and Bow Bridge. This takes in some of the heaviest traffic streets in London. The trial was started at 8 a. m., and ended at 1.30 p. m. The total distance covered was 46.4 miles. There were voluntary stops of 6 minutes and 58 stops for traffic totaling 23 minutes and 36 seconds. The average speed was 8.3 miles per hour. The car was started and driven on high gear only. After the luncheon period it was found that the car could not be started owing to a sticking exhaust valve.

A second test over the same route was made with this car a week later during which time the car covered 79 miles at an average rate of 10.7 miles an hour. During the test there were 113 stops all being voluntary.



Transverse and longitudinal sections through Favorit carbureter

The Rostrum



In which Letters from Readers are Answered and Discussed

No Taxation on Horse-Drawn Vehicles—Fire Department Collects Fees—Correct Place To Put Gearset—Development of the Cyclecar—Correction on Tax Laws—Bad Mesh Causes Gear Growl

Horse-Drawn Vehicles Are Not Taxed

EDITOR THE AUTOMOBILE:—Is there any law in the United States by which the horse-drawn vehicles pay a tax, the same as automobile owners? As you will see by the inclosed clipping, Colorado passed a law imposing a tax according to horsepower upon automobiles, and I consider it class legislation to tax one vehicle and not another, and will fight paying my $10 a year automobile tax after July 15, 1913, if I have a precedent to go by, as I already pay personal taxes on same, and heretofore we have been only paying $2 for a registration license and got a number and no more tax, except for personal property each year.

If you put me on the right track of someone who knows or tell me what has been done in other states, I will appreciate same, as I feel we automobilists are being unduly taxed.

Denver, Colo. W. L. H.

—THE AUTOMOBILE does not know of any state where horse-drawn vehicles are taxed in the same sense that motor cars are taxed for registering purposes. There are states where horse-drawn vehicles are compelled to pay a wheel tax the same as motor cars, but not to my knowledge a state where a registration fee is charged for horse vehicles.

This registration of motor vehicles beyond the cost of identifications is purely a double taxation matter as we have expressed from time to time.

As you are no doubt aware, the American Automobile Association is going to contest this matter in the Courts and take it to the Supreme Court in order to decide whether the present method of registration is legal or not.

Average Speed on a Tour of 2 Weeks

Editor THE AUTOMOBILE:—I am planning a vacation tour of 2 weeks in my car. In making my plans for this tour by the aid of a road map I have counted on averaging 20 miles an hour throughout the trip. During each day I am counting on making 120 miles in 6 hours as I intend traveling from 10 a. m. until 5 a. m. with a stop-off of an hour each day for dinner. At this rate, I will just finish the trip I intend making. The roads are for the most part very fair. Is this average about right? I do not want to travel more than 6 hours a day as I desire time for other recreation.

Cleveland, O. VACATION.

—You will have no trouble in making 120 miles a day over fair roads but you will find that unless you travel uncomfortably fast for a tour you will never average 20 miles an hour. It has been found that the many times it is necessary to slow down on account of villages, hills, curves, tire repairs and the various other likely causes that the average touring speed is close to 15 miles an hour.

Has Authority to Collect Automobile Fees

Editor THE AUTOMOBILE:—Has the Fire Department, Division of Combustibles, authority to collect $5 per year for a permit to keep an automobile?

Flushing, L. I. A. H. W.

—The law on this subject is printed in the regulations of the Municipal Explosives Commission adopted January 3, 1912, governing the storage and use of mineral oils, inflammable mixtures, combustibles mixtures, garages, motor vehicle repair shops, etc. Section 372 of the laws states that: "A permit may be issued for a garage on premises on which there is a dwelling occupied by the applicant or by his employee, provided that the entrance to the living apartment shall not be through the garage; and provided further that all motor vehicles stored or kept therein shall be the property of the applicant or of his immediate family, and that none of such vehicles shall be let out for hire."

Section 373 states: "A permit may be issued for a garage in a building occupied as a dwelling by either the applicant and one other tenant or by the applicant's employee and one other tenant, provided that not more than two floors or stories above the garage are occupied or used as living apartments, which apartment shall be separated from the garage by unpierced fireproof walls and floors; and provided further that all motor vehicles stored or kept in such garage shall be the property of the applicant or of his immediate family and that none of such vehicles shall be let out for hire."

In regard to fees, to quote section 101—"For a permit allowing the maintenance and operation of a garage as provided for in section 372 and 373 of these regulations, the applicant shall pay an annual fee of $5 for a single motor vehicle stored therein and an additional annual fee of $2 for each additional motor vehicle so stored."

A. L. A. M. Rating Known as the S. A. E.

Editor THE AUTOMOBILE:—I know how to figure the A. L. A. M. rating, but would like you to explain the S. A. E. and R. A. C. ratings and any other rating that may be used. Kindly explain same in such a manner that I can take my pencil and figure the horsepower after knowing the bore and stroke.

2—What is the proper horsepower for a car weighing 4,600 pounds with full equipment and tanks filled?

Morgantown, W. Va. B. H. MADEIRA.

—1—When the A. L. A. M. passed out of existence the old standards which had been adopted by this body were in a way wished upon the S. A. E. because it is part of the work of the Society of Automobile Engineers to standardize the measurements of all fittings. The A. L. A. M. spark-plug thread, for instance, which was adopted by that body, has now passed over to the S. A. E. which has adopted it as their standard. In the

matter of the horsepower formula the old A. L. A. M. formula has become to be known as the S. A. E. rating, although there is no official record on the books of the Society of Automobile Engineers to show that they as an institution have adopted the A. L. A. M. formula as their own. The R. A. C. is at present using the same rating that we know as the A. L. A. M., that is:

$$\text{Brake horsepower} = \frac{D^2N}{2.5}$$

In this formula D represents the bore of the motor, N the number of cylinders and 2.5 is a constant for all four-cycle automobile motors.

2—It is impossible to state what the proper horsepower for any given car weight should be because it depends upon where it is going to be used. It is evident that in the weight you give, the weight of the motor is included and this brings the matter down to the point of what proportion of the 4,600 pounds should be devoted to the motor. Automobile motors weigh very close to 25 pounds to the horsepower when they are built in the sizes ranging between 30 and 40 horsepower. A 40-horsepower motor, that is, one that will develop 40 horsepower on the brake, will weigh close to 1,000 pounds.

If you want a motor in the car that will take the passengers up any hill and in which you will not have to be continually dropping to a lower speed everytime that a slight grade is reached, the motor should be capable of developing 40 horsepower at least to carry comfortably the load of 4,600 pounds.

Where To Place the Gearset

Editor THE AUTOMOBILE:—A gearbox in unit with the motor enables the clutch to be inclosed, giving a very neat appearance; it is easily and therefore cheaply manufactured. Regarding simplicity, this depends upon the design of the unit, as some cars using unit power plants are readily accessible while others are anything but accessible. Regarding flexibility this type of construction can be hung so as to be undisturbed or thrown out of line.

The amidship position is very good for heavier and higher-powered cars when used without a subframe. However, the manufacturing expense is greater, and the extra universal joints, while no doubt in many cases trouble-proof, require lubrication from time to time. This construction insures a good distribution of the weight on the frame.

The rear axle location is one that requires much more thought and study than the average designer who has attempted this design has given it. The drawback is not the additional unsprung weight, but the absolute necessity of swinging the propeller tube and gearshift levers from the same common point. If this is not followed out, one of the most simple laws of mathematics is not taken into consideration and undue, and to say the least, unnecessary, wear is imposed upon the transmission gears. The fact that practically all of the manufacturers of all rear-axle gearboxes, as well as the manufacturers of cars having rear-axle gearboxes, have found it necessary to make changes from time to time and to add gear locks and to change the location of the gearshift lever goes to show that they have been having more or less trouble. Then again the fact that the distance between gearbox and the gearshift lever calls for long shift rods and connections means that there is bound to be play sooner or later in these linkages, which means that when the gearshift lever is in its proper place the shifted gear is not. In other words, the ten foregoing statements prove that the gears are not having a fair show as they are transmitting power when only partly in mesh.

It is granted that, by placing a universal joint between the differential and rear axle gearbox, these disadvantages can probably be overcome; but why not use either the unit or amidship construction and thus do away with this unnecessary wear and tear on the gearbox gears, one of the most delicate parts of the modern motor cars?

East Orange, N. J. M. H. POTTER.

Motor Will Not Throttle Down

Editor THE AUTOMOBILE:—What is the trouble with my motor? It will not throttle down but will run very well at high speed. If I leave the motor running slowly it will hit regularly on two cylinders and the other two will be dead. The ignition is in beautiful condition and I get a vigorous spark from the magneto at 50 revolutions a minute.

New York City. J. E. S.

—You have probably by this time tried giving your carbureter a little more gas. A richer mixture is really what you need at low speeds but the cause of the trouble is probably that too much air gets into the cylinder through bad valve seating or a leaky intake manifold. Note the joints and gaskets in the intake pipe as shown in Fig. 1. The valve guide also may be an object of suspicion. The probable cause of the entire trouble, however, you will find to be in that the valves need grinding.

Needs Larger Gasoline Spray Nozzle

Editor THE AUTOMOBILE:—In regard to Mr. Webb's trouble as printed May 15, I have had and am still having the identical experience with a car equipped with a Zenith carbureter. My car (Gregoire 18 horsepower) was built in 1910 and the carbureter was probably built for 1910 gasoline. I have had my cylinders rebuilt as you suggested to Mr. Webb, and did not in any way improve matters. It is my opinion that both of these machines (his and mine), are not getting enough gasoline and that enlarging the spray nozzle in the carbureter will help. If Mr. Webb wishes to know the results of my experience I will be glad to let him know.

As to Mr. De Luke's trouble, if he had a 30 by 4 tire instead

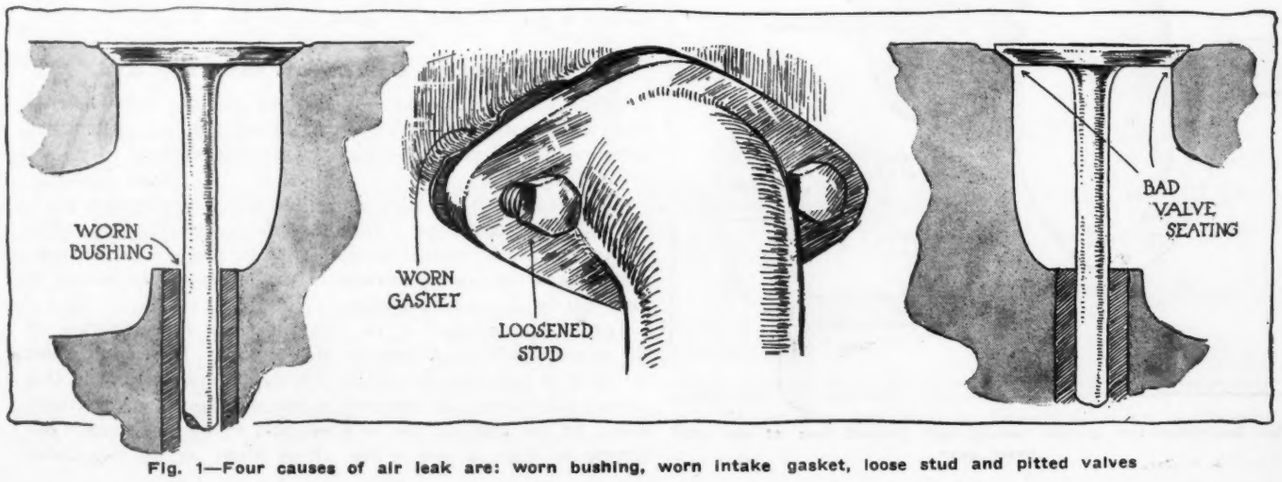


Fig. 1—Four causes of air leak are: worn bushing, worn intake gasket, loose stud and pitted valves

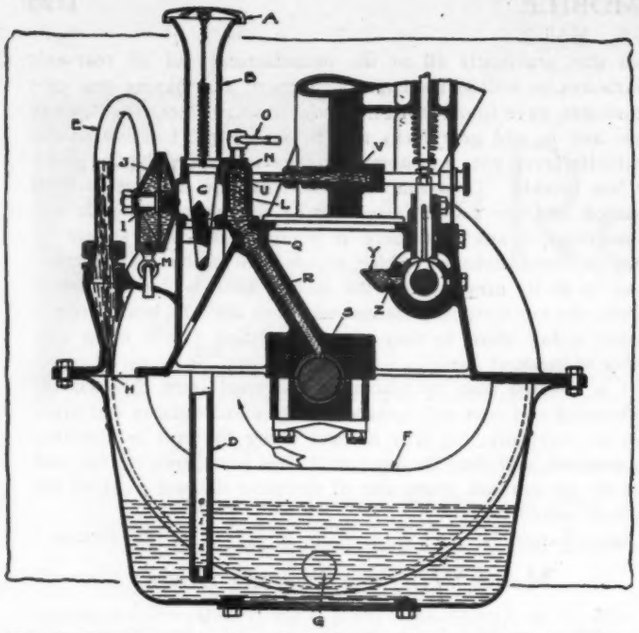


Fig. 2—Transverse section through the Hupmobile 32 crankcase

of a 30 by 3.5 he would have had an awful job getting it on and a worse one getting it off, as a 30 by 4 tire is smaller on its inside diameter than a 30 by 3.5.

New York, N. Y. GEORGE OPPENHEIMER.

Interested in Cyclecar Development

Editor THE AUTOMOBILE:—I am interested in the cyclecar which is attaining such prominence abroad and cannot see any reason why there is not a big field for such a type of vehicle in this country without infringing on the present field. From what I have been able to learn about the cyclecar it is a rational vehicle, and anything that is rational is sure to prove a winner if consistently pushed. With the increasing price of gasoline I see no reason why these economical little vehicles should not come into prominence in this country.

In your last issue I noted the consumption of gasoline in the recent Catskill tour over the 65 miles of road from New York City to Newburgh and having been over this road I know of the steep winding climbs up Crow's Nest Mountain, but am still convinced that our cars today use motors that are too large and also that many of our cars are too heavy.

I am quoting herewith some figures on cyclecar economy

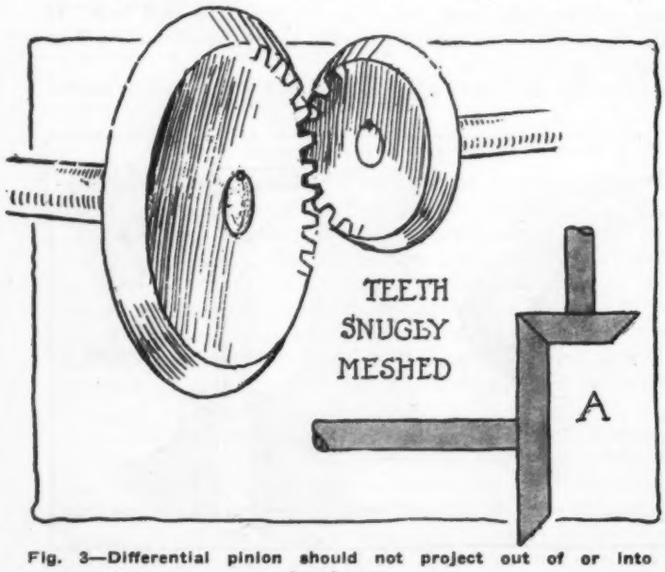


Fig. 3—Differential pinion should not project out of or into bevel gear

which I noticed in a recent issue of *The Cyclecar*. This was a road test with steep hills. The winning cyclecar averaged 82.1 miles per gallon. Its weight with passengers was 819 pounds. Other cyclecars averaged 69.67, 62.59, 56.54, etc., miles per gallon.

These figures speak real economy. With gasoline at 20 cents per gallon and 1 gallon doing for 80 miles, there is a cost of but .25 cent per mile for fuel. This is the type of vehicle that thousands of would-be car owners would like to have. It is a light car, one easy on tires and very cheap on fuel. It is not necessary that such a car be exceptionally cheap at first cost, rather that it be cheap to operate. There are hundreds who can afford to buy vehicles, but who object to the high cost of maintenance. It seems to me that the cyclecar offers an excellent solution to this problem.

Albany, N. Y. LIGHT CAR.

Correspondent's Error Corrected

Editor THE AUTOMOBILE:—The writer noticed in THE AUTOMOBILE for March 20 an account of the new automobile tax laws of Indiana, and note that you have an incorrect report of same. The correct rates are copied from the Acts of the 1913 Indiana Sixty-eighth Session, Section Six, as follows: "The following fees shall be paid to the secretary of state upon the registration or re-registration for each calendar year. For each motor bicycle so registered, the sum of $2; for each motor vehicle of 25 horsepower or less, the sum of $5; for each motor vehicle of 40 horsepower or less and more than 25 horsepower, the sum of $8; for each motor vehicle of 50 horsepower or less and more than 40 horsepower, the sum of $15; for each motor vehicle of more than 50 horsepower, the sum of $20, and for each and every electrically propelled motor vehicle so registered, the sum of $3. Provided that for motor vehicles which are used or to be used solely for commercial purposes, the fee for such registration shall be $5 annually."

I note that you did not state in your previous account the method to be employed in calculating the horsepower in conjunction with this law.

Section 2 states that "in application for license party must state name of manufacturer and factory number of vehicle, the character and amount of motive power stated in figures of horsepower in accordance with the rating established by the association of licensed automobile manufacturers." This the writer concludes to be the old A. L. A. M. formula which is

$$\frac{D^2N}{2.5} = H.P.$$

There has been much discussion among Indiana automobile owners regarding this law, as most of them had read your accounts in THE AUTOMOBILE. Consequently, I think you owe it to your Indiana readers to make the correction.

Romney, Ind. CLYDE L. BURGHARDT.

—This was an error by the correspondent which THE AUTOMOBILE is glad to have corrected as per Mr. Burghardt's letter.

Lubricating System of the Hup 32

Editor THE AUTOMOBILE:—Would you call the Hupmobile 32 lubricating system a splash system? Does a splash system use more oil than a pressure-splash or pressure system?

San Diego, Cal. MARK JUNGK.

—The Hupmobile 32 lubricating system is a combination gravity and force-feed type. Although the camshafts and valve mechanism are lubricated by the spray thrown off by the connecting-rods the bearing surface of the motor are lubricated in the main by the gravity system.

The oil is contained in the lower part of the crankcase of the motor which has a capacity of 3 gallons. This is one point in which it resembles the splash lubricating systems and in this type of lubrication the reservoir is generally found in the crankcase. In the Hup car the flywheel acts as the oil pump. Referring to Figs. 2 and 5, the oil is lifted up by the spaces

G in the flywheel and carried up to the passage H. At this point the oil is thrown with considerable force, due to centrifugal action, through the inverted U-shaped passage E. From this point the oil runs to the chamber I. Within this chamber there is an oil strainer J, through which all the oil is compelled to pass, taking out the dirt and grit which can be drained off occasionally by opening the petcock M.

The oil now passes to the body of the oil regulator I, which governs the amount of feed to the bearings. It is automatic in its action and is controlled by an interconnection with the throttle. The oil is distributed from the regulator to the crankshaft and cylinders by means of a valve N, which is operated by a lever O connected to the accelerator through the mechanism P. When the throttle is opened about one-quarter the entire way, the valve N in the regulator starts to open and allows the incoming oil at L to flow down the channel R to the main bearings S. The oil channel is an integral part of the crankcase being drilled through the webs of this casting. From the main bearings the oil passes through the holes in the crankshaft and thence to the lower connecting-rod bearings and by centrifugal force the excess is sprayed all over the interior of the motor. This oil spray which pervades the entire crankcase is sufficient to oil the pistons at low or ordinary motor speeds. At higher motor speeds or when climbing hills and the throttle is more than half open the valves begin to open to the oil tubes at U and allow the oil to flow to the cylinders through the openings which register with the opening in the ends of the wristpins when the piston is at the bottom of its stroke. Though the openings in the wristpin the oil finds its way in sufficient quantities to thoroughly lubricate the piston.

Splash and force-feed systems use about the same amount of oil. It takes a definite amount of oil to properly lubricate a motor and a correctly designed system will first use that given amount.

Difference in Power with Muffler

Editor THE AUTOMOBILE:—Kindly let me know if there is any increase in power by reason of running cars using gasoline as fuel with the muffler cut out. I claim that there is no appreciable increase if the car is provided with a large size exhaust pipe entering muffler. In cities the practice is, I believe, generally prohibited. Is there any make of car that is not provided with a cut out?

Warrensburg, Mo. A. L. KENYON.

—The chart, Fig. 4, shows the small difference in power with and without a muffler cut out at a recent test made on a Packard motor. It will be noted that this was so small that it could not be noted in running the car.

There are several makes of cars that are not furnished with cut outs. The Peerless car is a noteworthy example of this as the makers have not been putting cut outs on the car since the car was first put on the market.

Incorrect Meshing Causes Growl

Editor THE AUTOMOBILE:—Will you kindly give me some information on how to silence a noisy differential gear? My car is a Maxwell runabout AA model, 1910. The gears make a growl. There is plenty of heavy grease in the housing. In fact, it was recently taken out and examined. What depthing should the drive pinion have? Is this noise caused by pinions not being meshed properly, either too deep or shallow? Please give me instructions on how to obtain the proper depthing for pinions, also other probable causes to be looked into for this trouble.

Clinton, N. C. F. R.

—Gears which are meshed improperly have a tendency to set up a rubbing action when meshed too deeply and thus give rise to a humming sound. When the meshing of the gears is not deep enough a rattling sound is produced rather than the continuous hum of the too deeply meshed gear. The correct meshing of the gears cannot be better described than that the teeth

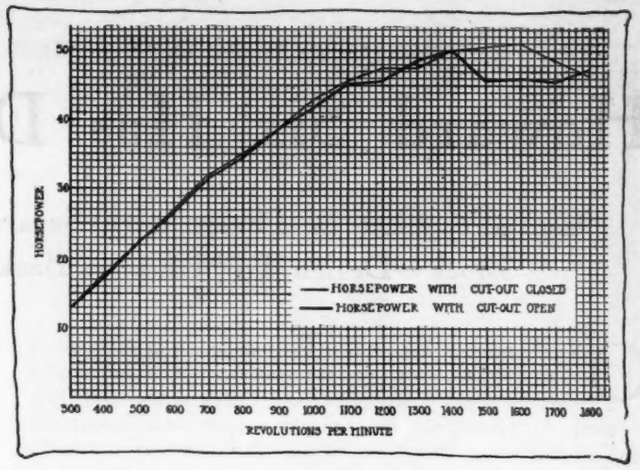


Fig. 4—Chart showing difference of horsepower with and without muffler

should fit together snugly without play. This is distinguished from gears in which the teeth are pressed tightly against one another. It will be remembered that where the 45-degree pinion meshes with the differential wheel there is a considerable wedging action possible. This may be understood from Fig. 3 which shows how these two gears mesh. When the pinion is moved back too far it is capable of exerting a tremendous wedge action which, combined with the ordinary driving pressure, is sufficient to cause a rapid grinding away of the teeth. Grinding actions are always combined with noise because the nature of the operation sets up a strong vibratory action in the metal.

When the gears are meshed too deeply a tap or knock will result at every change of load. Under a constant load there is a good possibility of the gears being pressed firmly together by the load and the knocking or rattling effect will not be so apt to be produced.

It must be remembered that the main cause of noisy gears is not so apt to be a faulty meshing of the gears but will rather be due to the fact that the gears themselves have worn. When the gears are worn, a temporary silencing effect will be secured by bringing them deeper into mesh, but the next wear will be quicker since the hardest part of the gears will have been worn away by that time. In bringing differential gears closer into mesh with the driving pinion the two gears should be worked together. That is, the pinion should be moved back slightly while the differential gearwheel should, at the same time, be moved over toward the pinion. This makes a sort of double adjustment which is really necessary to compensate for the different conditions which will result from changing only one of the gears.

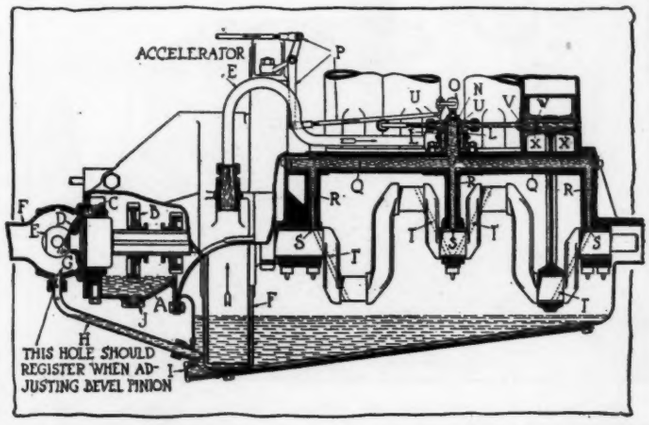


Fig. 5—Longitudinal section of the Hupmobile crankcase showing oiling

Howard Six Has Double Exhaust Line

Cylinders Cast in Threes with Separate Manifold and Muffler for Each Block—Design To Minimize Back Pressure and To Insure Silence

ONE of the new cars which was announced at the time of the Chicago Show was the Howard Six, manufactured by the Howard Motor Car Co., Connersville, Ind. This company is utilizing the old Lexington plant and started the work of assembling chassis in March. The plant has a capacity of 1,000 cars a year.

The new car is distinguished by minor refinements rather than by any radical tendencies in design. It is an assembled car and one of the aims of the designers, H. P. Tuttle and J. C. Moore, was to standardize all parts as far as possible. Some of the novel features are the use of a double muffler, double flexible exhaust pipe, and the bracket for extra tires bolted to the frame as shown in Fig. 2. The carrying of the wiring, gearshift slot arrangement and other similar details form practically the only departures from conventional practice as may be seen in the accompanying illustrations. The Electro starting and lighting system is used. The six-cylinder Continental motor of 4.125 and 5.25-inch bore and stroke develops 45 brake horsepower at 900 revolutions per minute and 60 brake horsepower at 1,500 revolutions per minute. The cylinders are cast in threes, the valves being inclosed by cover plates. Views of the motor are given in Figs. 3 and 4. The cover plates are shown in Fig. 3, which also shows the high mounting of the carbureter for accessibility and the exhaust manifold, the flexible tubes of which may be seen in Fig. 1. The idea in using the double exhaust system is to minimize a back pressure from the muffler and also to insure silent running. Three exhaust valves open into each exhaust line so that any one valve in either line if closed for 45 degrees crankshaft travel before the next valve in the same line opens. Four-point suspension is used for the motor and gearbox unit. The big truss support used at the front of the motor is shown in Figs. 3 and 4. The unit power plant is also supported by a subframe. An interesting feature of the design is that the motor is secured directly to the frame, thus obviating the necessity of a dustpan.

As may be seen in the illustration, Fig. 1, left drive and center control have been adopted by the designers, the steering column passing under the hood, while the gearshift is located directly on the gearbox.

Fig. 1—View of Howard six chassis, looking forward. Note flexible double exhaust pipes and junction box carrying the wiring beyond the dash. The box on the left running board contains the control switch and batteries for the Electro lighting and ignition system

Lubrication is of the splash system with constant level, driven by a plunger pump, with pockets for all bearings. The oil is fed up around the valve push rods, with an overflow back into the crankcase. Two oil fillers are used, one situated on the timing-gear case and the other at the back of the crankcase. Two universal joints are used between the gearbox and the differential.

Cooling is effected by means of a fan and centrifugal pump. The fan is adjustably mounted on top of the timing-gear case. An English and Mersick radiator of large capacity are used.

The method of carrying the wiring is distinctive, all wires passing through a junction box in front of the dash.

The Electro lighting and ignition system is employed. This system drives and is driven through the pump shaft and pump gear by means of a silent chain pulley belted to a pulley on the crankshaft by a Conventry chain. The control switch and battery for the starter are carried inclosed on the left running board. The battery used comprises twelve 24-volt, 20-ampere Willard cells.

Adjustable Individual Clutch Brake

An adjustable individual brake is used on the clutch to facilitate shifting of the gears. The adjustment is tightened in order to bring the clutch to a quick stop.

A Warner-Toledo gearbox is used, furnishing three speeds forward and reverse.

Drive is by shaft and bevel gear, final drive being through the springs and the torsion rod which is shown in Figs. 1 and 2.

The rear axle is of the standard Timken type having continuous press steel housing. The carrier comprises a complete power unit with gears, bearings and differential integral. Gears are forged heat-treated and ground. All moving parts are mounted on adjustable rolling bearings. The torque rod pins are hardened and ground and swivel in hardened and ground bushings with an adjustment for end thrust. The driving shaft is of nickel chrome steel with driving dogs formed integral and all moving parts are thoroughly protected from dust.

Brakes are of the external contracting and internal expanding type, 17 inches in diameter, the drums being of heavy pressed steel and all operating parts being provided with anti-rattling devices.

The tires are 36 by 4.5 inches all around and Firestone quick-demounable rims are regular equipment.

The Warner type of steering column and gear is employed. This embodies the worm and full gear construction, the latter being mounted below the worm in the usual way. Ball thrust bearings are fitted above and below the worm. It is adjustable in every way. The worm gear is integral with its shaft which is eccentrically mounted in a sleeve so that wear may be easily taken up.

The car is built in five-passenger touring form only, at the present time.

Although the designers have adhered to usual practice in the major details there are several little refinements which are well worthy of mention as indicative of unusual forethought and

consideration for the comfort of the driver. Some of these are as follows:

A feature especially worthy of notice is the big tire bracket shown in Fig. 2.

This is bolted to the frame. It will carry either one or two tires and is designed to sustain a weight of 1,000 pounds. It is adjustable so that when arranged for carrying one tire there is no visible indication of a support for a second. No straps are required for securing the tires to the bracket.

An interesting departure is incorporated in the gearshift gate. Most gates have some mechanical stop arrangement to keep the driver from inadvertently throwing the lever into the reverse position while changing gear. In the Howard car a little psychological study evolved the idea that the driver will unconsciously pull the lever toward the reverse slot when he desires to reverse and that he will not exert this pull in simply changing from one forward gear to another. Consequently the Howard gate contains no stop but there is a slight curve in the gate itself which throws the gearshift lever across the H of the slot into second speed, reverse requiring the side pull to prevent the lever from crossing the slot.

The accelerator is of an unusual type, being globular in form, so that it may be operated from any angle. It is also made in such a way that it fits under the instep of the ordinary shoe, so that all the driver has to do to actuate the accelerator or to release it is to move his foot slightly backward or forward. This design permits of so great a variety of positions on the part of the driver that it should be a welcome feature, as the ordinary accelerator pedal permits of but one or two positions of the foot, which consequently becomes very tiring.

Novel Design of the Gasoline Tank

The 18-gallon gasoline tank is located under the front seat and pressure is maintained by an automatic positive pump driven by the camshaft. The novel feature of the gasoline tank is that it is shaped with an inclined bottom in order to assure fuel pressure at the carbureter when the car is tilted on an uneven road surface. There is a gauge on the footboard which shows that the gasoline is apparently all out at a point when there is still capacity for 40 miles.

The front lamps are controlled by a switch situated at the bottom of the steering column. The wiring of these lamps is interesting, the wires being carried up into the inside of the lamp brackets, thus protecting them and at the same time concealing them. The rear lamp is wired in a somewhat similar manner, the wire passing up through the frame to the lamp mounted on the tire bracket as shown in Fig. 2.

The spark lever on the steering column segment is fulcrumed in such a way that, although the lever is operated in the ordinary way to vary the timing of the spark, pressing it down blows the electric horn which is mounted at the left of the motor inside the hood with the bell projecting through the side of the hood. In mounting the horn in this manner it is no longer an excrescence but at the same time its efficiency as a warning signal is not diminished.

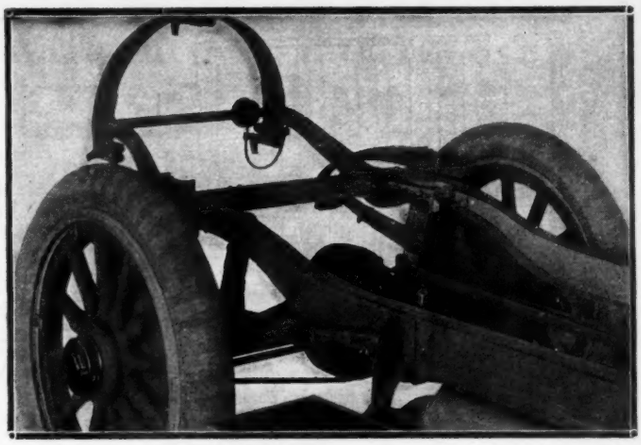


Fig. 2—Rear of the Howard chassis, showing the method of carrying the tire bracket. The spring suspension may also be seen, as well as the manner of covering the bolts on the rear hub caps

A feature of the horn mounting is that there is a fuse for each line permitting of testing out the wiring for any short circuit without removing the body.

The unsightly bolts on the rear wheel hubs are concealed by a metal cover put on inside the hub cap. The springs on the brake band levers are continued up in front.

Hassocks are used instead of a foot rest in the tonneau and are fastened to straps so that they can be pulled backward or forward according to the desire of the passenger.

Springs are of the conventional type, semi-elliptic being used in front and three-quarter-elliptic at the rear. Grease cups are fitted on all spring shackles and bolts. In designing the car special attention was paid to making the springs accessible for external lubrication.

Tools are carried in compartments in the cowl of the dash. There is also a small light fitted in the dash. The Troy rain vision windshield used is made a part of the cowl and requires no braces. Pump, jack, and inner tubes are carried in a compartment under the back of the front seat.

Regular equipment includes Stewart speedometer and grade indicator, mohair top and Jiffy curtains as well as the usual complement of tools and similar minor details.

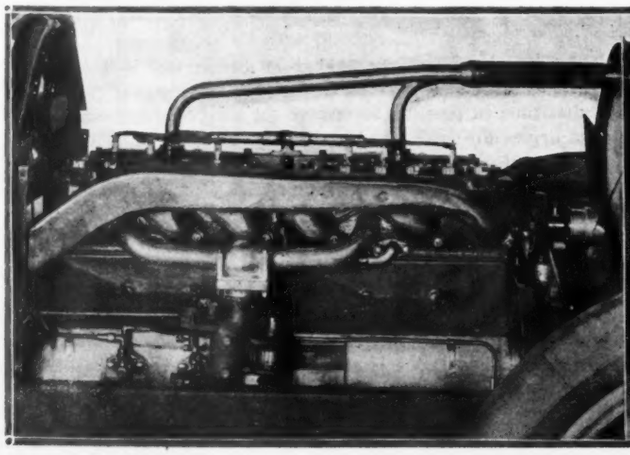


Fig. 3—Right side of the Howard six motor, showing high mounting of carbureter, neat method of carrying wires over the top of the motor and novel form of exhaust manifold

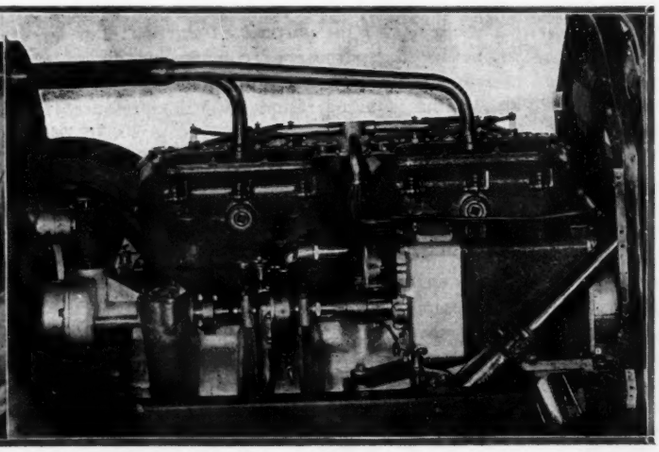
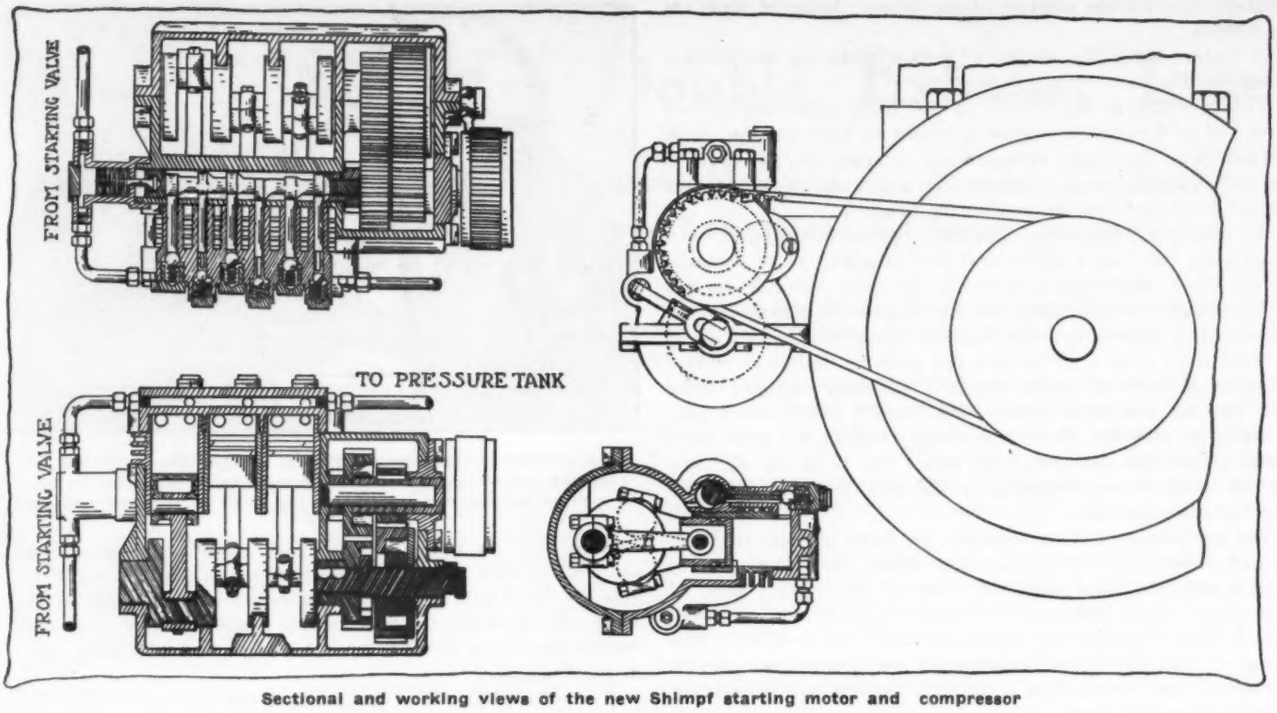


Fig. 4—Left side of the Howard six motor, showing mounting of the Electro lighting and ignition system on the pump shaft, manner of wiring and placing of petcocks on sides of cylinders



Sectional and working views of the new Shimpf starting motor and compressor

Unit Pumps and Starts

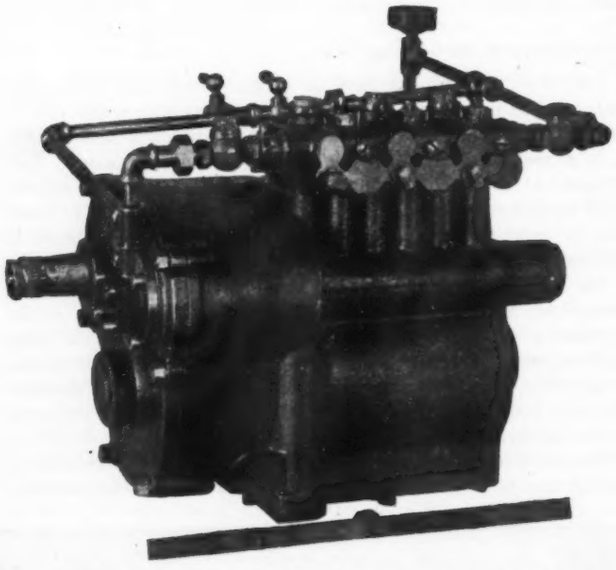
Can Crank the Motor or Pump the Tires As Owner Desires by Making One Simple Adjustment

THE SHIMPF starting motor and compressor, designed and built by Walter H. Shimpf, 1931 Broadway, New York City, as indicated by its title, is a motor and compressor combined in one unit, a device which under certain adjustment will act as a motor and under different adjustment will act as a compressor for compressing air, which may thereafter be utilized for various purposes, such as cleaning the car, operating brakes, blowing signals, pumping tires, etc., including the operation of the device as a motor.

When used in connection with an automobile, it is directly connected by a suitable means with some moving part of the engine, and through a system of gearing and automatic clutches, will either drive the engine for the purpose of starting it or be driven by the engine for the purpose of compressing air to a predetermined pressure into a receiving tank, thereafter remaining idle while the engine is in operation until the pressure is reduced.

The point of connection between the combined starting motor and compressor and the engine is, of course, immaterial as long as such connection insures the proper driving effect from the motor and compressor to the engine, and from the engine to the motor and compressor. The combined motor and compressor is what might well be termed a single-acting motor and and a multiple compressor, inasmuch as the various pistons receive an impulse of movement from the compressed air, exhaust at the end of the stroke, and discharge the contents of the cylinders during the return stroke without working against the compressed air; and when acting as a compressor, compress as individual pistons.

The opening of a valve on the dashboard automatically shifts the camshaft so as to bring into contact with the cams one or more of the push-rods, opening the valve to whichever cylinder



Exterior view of the Shimpf air-compressor motor

is at that time in position to receive the air under pressure; this in turn drives the piston and crankshaft, making an independent air motor which, through the two-to-one gear between the crankshaft and the jackshaft of the motor and a two-to-one gear between the jackshaft and the engine, revolves the crankshaft of the automobile engine, rotating the same until combustion takes up these duties. As soon as the automobile motor has started the closing of the dash valve allows the camshaft to return to a position where the cams do not actuate the push-rods, this operation making the valves automatic and the device a compressor. This device is so designed that by the shifting of the camshaft the various pistons will act directly as compressors or as driving pistons utilizing the same valves and depending upon whether the valves are actuated by the camshaft or actuated automatically.

With the two-to-one gear reduction between the jackshaft of the motor and the engine, when the engine is running, the jack-

shaft would revolve twice as fast as the engine shaft; to overcome this increased speed so that the crankshaft of the compressor will revolve at the same speed as the crankshaft of the engine, a counter reduction of two to one is placed between the jackshaft and the crankshaft of the compressor. The gearing of the starting motor and compressor is controlled automatically by roller clutches.

The present device is a three-cylinder, 1.625-inch bore by 2.125-inch stroke with crankpins at 120 degrees. The cylinder, crankcase and gearcase are block castings, occupying a space 13 by 10.75 by 8 inches.

The lubrication is by splash, the crankcase and gearcase acting as an oil reservoir. A pneumatically controlled dental clutch between the crankshaft and the two-to-one counter reduction controls the action as a compressor, allowing the compressor to operate until a pressure of 200 pounds is attained, and at that point automatically disconnecting so that the crankshaft, piston, etc., are idle. With this feature a very small amount of time and only a minimum power are required for its operation.

—

OBSERVED AND CALCULATED CRITICAL SPEEDS—Prof. Dunkerly has demonstrated by experiment the existence of critical speeds in shafts and found that for shafts freely supported at the ends the observed critical speeds agreed very closely with those obtained by calculation.

Dr. Stodola in his experiments upon shafts has proved the existence of critical speeds of the second and third order and found that the ratio between the first and second and third speeds agreed closely with the calculated values.

To quote Dr. Stodola, "To prevent fracture of the shaft its greatest amplitude of vibration was limited to about .394 inch radius by rings about the shaft. The very first experiment proved the existence of higher critical velocities. The shaft vibrating originally at about .04 inch showed with an increasing velocity an unstable running; at about the critical value it bent and began to rub hard against the rings. Hardly had the critical value been exceeded before the shaft straightened out and no initial vibration could be observed."

It appears that as a general rule the running speed of automobile shafts is well below the critical value. It is, however, possible in some instances that at the high speeds used under service conditions, the vibrations due to the inequalities of the road surface may have a value so close to the natural frequency of the shaft under these conditions, as to become dangerous.

Claims 60.5 Efficiency

Combination Two-Cycle and Turbine Motor Said to Make Big Cut in Heat Losses

—

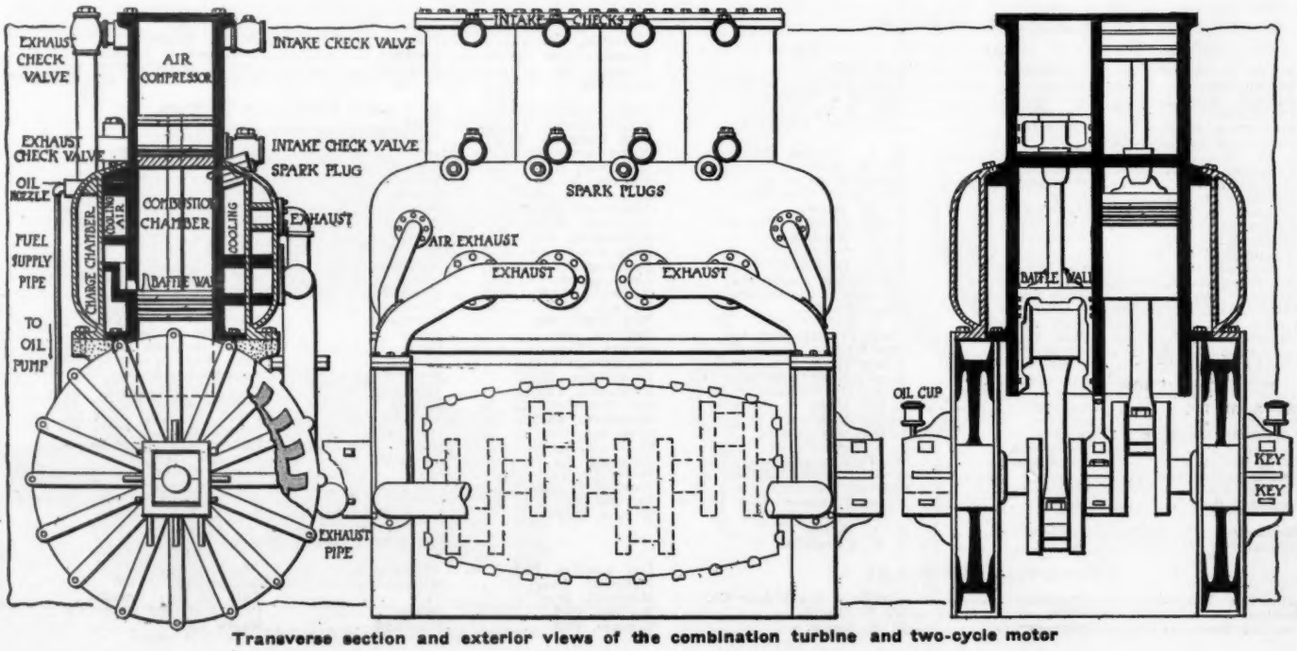
A COMBINATION two-cycle and turbine motor is the latest offer to the trade and public. The motor, which is shown in the illustration at the foot of this page has a double jacket around the cylinder. The inner jacket is for the cooling air while the outer jacket is for the incoming charge. Air is compressed in a cylinder above the combustion chamber and passes through the cooling jacket.

The lower part of the motor looks very much the same as an ordinary two-port two-cycle motor. The intake port is uncovered by the piston in its travel and the charge which is released from the passage around the cylinder enters the combustion space. The compression stroke takes place and the charge is then fired, exhausting at the bottom of the stroke into a passage leading to the flywheel casing which contains the turbine wheel.

The designers of this motor claim a marked gain in thermal efficiency resulting from their method of cooling and by utilizing the exhaust. It is claimed that the cooling losses instead of amounting to 33 per cent. as is now the case with the gasoline motor, will be cut down to one-half that and the exhaust loss which has been estimated at 44 per cent. in the average engine will be cut down to 22 per cent. The designers state that a large proportion of this loss will be transferred to the useful work of the motor and the resulting gain in thermal efficiency will amount to 38.5 per cent. According to this the thermal efficiency would amount to something like 60.5 per cent. This startling figure is claimed by the makers, the American Sem-Turbine Co., St. Louis, Mo.

A two-cylinder stationary engine of the type described above and illustrated herewith has been built and is now on exhibition at the headquarters of the company in St. Louis.

From a study of the drawings a motor of this design would appear to be 30 per cent. higher than an ordinary type. This is due to the placing of the air compressor on top of the cylinder. The air compressor is an integral part of the cylinder and in reality forms a supplementary reciprocating air pump.



Transverse section and exterior views of the combination turbine and two-cycle motor

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BROOKLYN, N. Y.—Barber Auto Service Co.; capital, $10,000; to deal and hire automobiles. Incorporators: William Barber, A. S. Barber, M. F. Barber.

CINCINNATI, O.—Allen Breed Tractor Co.; capital, $5,000; to manufacture tractor engines. Incorporators: Allen Breed, L. J. Dolle, H. V. Reedy.

CINCINNATI, O.—Queen City Motor Delivery Co.; capital, $50,000; to deal in automobiles, transporting and delivering merchandise and passengers. Incorporators: Louis Hehman, H. G. Hehman.

CLEVELAND, O.—Haupt Co.; capital, $5,000; to deal in automobiles. Incorporators: W. D. Haupt, H. A. Couse, R. G. Curren, Mary McManus, Alfred Clum.

DETROIT, MICH.—Grant Motor Co.; capital, $100,000; to manufacture a small type of car of the cyclecar class. Incorporators: G. D. Grant, C. A. Grant, David Shaw, G. F. Salzman, J. M. Howe.

DETROIT, MICH.—Wahl Motor Co.; capital, $85,000; to manufacture automobiles. Incorporators: G. G. Wahl, A. M. Dodge, Michael Matchwill, W. J. Heckish, E. E. Havens, T. M. Lemon.

JACKSONVILLE, FLA.—White Sales Co.; capital, $100,000; to deal in automobiles. Incorporators: J. R. Collins, P. D. Cassidy, N. A. Collins.

LANSING, MICH.—Carter-Car Sales Co.; capital, $4,000; to deal in automobiles. Incorporators: E. H. Jenks, Charles Schmidt.

LITTLE ROCK, ARK.—Arkansas Automobile Exchange; capital, $5,000; to deal in automobiles. Incorporators: Sam Yout, Estell Yout, S. J. Fechbeck.

LOUISVILLE, KY.—Crown Motor Car Co.; capital, $500,000; to manufacture automobiles. Incorporators: V. F. Lambert, N. V. Lambert, C. H. Lambert.

NEW YORK CITY—Universal Equipment Co.; capital, $50,000; to deal in engines. Incorporators: George Gray, T. W. Hatfield, I. B. Owens.

PITTSBURGH, PA.—Pittsburgh Haynes Automobile Co.; capital, $10,000; to deal in automobiles. Incorporators: H. S. Morrow, E. K. Morrow, Alva Hughson.

ROCHESTER, IND.—Rochester-Mais Commercial Car Co.; capital, $25,000; to manufacture motor trucks. Incorporators: J. A. Mais, A. C. Davisson, E. A. Miller, J. M. Ott, R. P. True.

ST. LOUIS, MO.—H. G. Borbein & Co.; capital, $10,000; to deal in automobiles. Incorporators: H. G. Borbein, L. W. Becker, L. B. Borbein.

SYRACUSE, N. Y.—Service Boat and Engine Co.; capital, $10,000; to deal in motors. Incorporators: W. J. Eastman, L. J. Rolfsen, C. L. Ripley.

TRENTON, N. J.—Hall & Taylor Co.; capital, $25,000; to deal in automobiles. Incorporators: W. H. Taylor, H. A. Hall, Harold Hall.

WILMINGTON, DEL.—Electromobile Co.; capital, $100,000; to manufacture an electric automobile. Incorporators: H. E. Latter, W. J. Maloney, O. J. Reichard.

WILMINGTON, DEL.—Victor Motor Car Co.; capital, $100,000; to deal in automobiles.

GARAGES AND AGENCIES

ANTIGO, WIS.—Holland Flexible Auto Wheel Co.; capital, $10,000; to manufacture a flexible wheel for automobiles and trucks, which obviates the need of pneumatic tires. Incorporators: J. L. Donahue, J. E. McKenna.

BALTIMORE, MD.—Dreadnought Tire & Rubber Co.; capital, $1,000,000; to manufacture automobile tires. Incorporators: A. F. Gilbert, Wilmer Dunbar, W. E. Hill, C. P. Triplett, W. B. Swindell, Sr., A. A. Adt, A. F. Gilbert, W. E. Hill, C. P. Triplett, R. H. Diggs, H. E. Whitelock, A. B. Whitelock, G. H. Rice.

BROOKLYN, N. Y.—Atlantic Garage Co.; capital, $5,000; general garage business. Incorporators: J. M. Simon, Charles Steinbeck, Mary Steinbeck.

BUFFALO, N. Y.—Buffalo Automobile Spring Co.; capital, $10,000; to manufacture springs for automobiles. Incorporators: Earl Plantz, W. E. Slater, H. E. Spangler.

CHICAGO, ILL.—Ferns Motor Livery; capital, $50,000; automobile livery. Incorporators: M. M. Franey, A. J. Colline, H. P. Mumms.

CLEVELAND, O.—Cleveland Automobile Country Club; capital, $7,500; to carry on an automobile club. Incorporators: T. P. Cagwin, H. M. Adams, R. H. Lee, F. H. Caley, A. A. Atwater.

DETROIT, MICH.—Chambray Carburetor Co.; capital, $50,000; to manufacture carburetors and other automobile accessories. Incorporators: J. H. Chambes, H. W. Mowbray, C. H. Bennett.

FLUSHING, N. Y.—Flushing Auto Moving Express and Taxi Cab Co.; capital, $1,000; automobile express business. Incorporators: Nicholas Gilroy, James Whitcher, Robert Mills.

INDIANAPOLIS, IND.—Oakes Pressed Steel Co.; to manufacture steel stampings. Incorporators: W. H. Oakes, W. D. Oakes, C. G. Swenson.

MILWAUKEE, WIS.—Porto Metal House & Garage Co.; capital, $5,000; to manufacture and market portable steel structures for automobile storage or outing purposes. Incorporators: J. E. Tracy, P. G. Meyer, J. P. Weber.

NEW YORK CITY—Specialty Auto Parts Co.; capital, $5,000; to deal in automobile accessories. Incorporators: G. I. Aronow, A. M. Newburg, A. H. Peyser.

NEW YORK CITY—Square Motor Horn Co.; capital, $5,000; to deal in automobile horns. Incorporators: S. Soegnamillo, Frank Buckman, Alexander Karlin.

PHILADELPHIA, PA.—New Idea Tire Co.; capital, $500,000; to manufacture automobile tires. Incorporators: F. R. Hansell, G. H. B. Martin, S. C. Seymour.

SAN ANTONIO, TEX.—International Automobile School of San Antonio; capital, $4,000; to instruct pupils in repairing automobiles. Incorporators: T. P. Price, J. A. Kerr, Gus Leroy.

SCRANTON, PA.—Economy Automobile and Lackawanna Vulcanizing Co.; capital, $10,000; to vulcanize automobile tires.

SYRACUSE, N. Y.—Syracuse Auto Radiator Co.; capital, $50,000; to manufacture the Kaman radiators. Incorporators: Max Kaman, Minnie Kaman, Thomas Vickers.

TOLEDO, O.—Toledo Merchants Delivery Co.; capital, $50,000; to do a general deliver business and storage business. Incorporators: J. H. Pheatt, G. M. Reswick, H. W. Braser, L. F. Luscombe, J. E. Parsons, Jr.

WILMINGTON, DEL.—E-Z Auto Tire Pump Co.; capital, $20,000; to manufacture an automobile tire pump. Incorporators: F. D. Buck, G. W. Dillman, B. M. Grawl.

WILMINGTON, DEL.—Pneumatic Rim & Tire Co.; capital, $200,000; to deal in automobile tires and accessories. Incorporator: Harry Davis.

CHANGES OF NAME AND CAPITAL

AKRON, O.—Diamond Rubber Co.; capital, decreased from $100,000 to $10,000.

BIRMINGHAM, ALA.—Robertson Tire & Auto Co.; capital increased from $20,000 to $50,000.

FOSTORIA, O.—Allen Motor Car Co.; capital increased to $500,000.

INDIANAPOLIS, IND.—Cole Motor Co.; capital increased from $500,000 to $1,000,000.

NEW YORK CITY—Studebaker Vehicle Co.; capital decreased from $3,600,000 to $600,000.

New Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Battle Creek, Mich	Henderson	A-B Stove Co.
Boston, Mass.	Knox	Knox Auto Co. of Springfield.
Calgary, Alta	Cadillac	McLeod & Williams.
Carrollton, O.	Studebaker	Tope & Beamer.
Charleston, S. C.	Henderson	Automobile Repair Co.
Charleston on Kanawha, W. Va.	Henderson	R. L. Frasier, Jr.
Cleveland, O.	Henderson	W. E. Warters.
Columbus, O.	Herreshoff	Johnston Sales Co.
Columbus, O.	Regal	Ohio Auto Sales Co.
Creston, Ia.	Oakland	N. M. Brown.
Fredericton, N. B.	Franklin	Smith Foundry Co., Ltd.
Hundred, W. Va.	Henderson	F. Q. Berdine.
Huntington, W. Va.	Henderson	J. A. Tucker.
Huntsville, Mo.	Henderson	M. H. Callahan.
Kamloops, B. C.	Cole	Leacroft & Hepburne.
Kamloops, B. C.	Studebaker	Leacroft & Hepburne.
Little Falls, N. Y.	Henderson	Frank Burgor.
Logan, O.	Ford	C. R. Luts.
Merritt, B. C.	Ford	Nicola Valley Gar. Co.
Niagara Falls, N. Y.	Henderson	Mat Walsh.
Oskaloosa, Ia.	Henderson	Amsberry & Henniess.
Philadelphia	Maxwell	Farming-Paxon-Maxwell Co.
Pittsfield, Mass.	Alco	C. C. Gramwell.
Plymouth, Ind.	Oakland	F. H. Kuhn.
Portland, Ore.	Haynes	J. D. Pacquet.
Portland, Ore.	Marion	United Auto Co.
Richmond, Va.	Henderson	L. Casselman, Jr.
Richmond, Ind.	Henderson	W. T. Bradway.
San Antonio, Tex.	Ohio	Woodward Carriage Co.
Seattle, Wash.	Chandler	Clayton Gibson.
Toronto, Ont.	Norwalk	Norwalk Motor Car Co. of Martinsburgh, Va.
Waukegan, Ill.	Henderson	H. L. Beach.
Youngstown, O.	Velie	T. H. Chambers.

COMMERCIAL VEHICLES

Appleton, Wis.	Stegeman	Griffin & Scott Auto Co.
Boston, Mass.	Dart	W. F. Magill.
Boston, Mass.	Mercury	G. F. Kelen.
Burnside, Ga.	Indiana	N. W. Findley.
Calgary, Alta	Stewart	Lougheed & Webster.
Chicago, Ill.	Stewart	Austin Doyle's Sons Co.
Columbus, O.	Brown	Fourth-Chestnut Auto Repair Co.
Cook County, Ill.	Four Wheel Drive	W. B. Wells.
Elizabethtown, Pa.	Dart	E. C. Cobble.
Fort Plain, N. Y.	Stewart	H. B. Gray Co.
Harrisburgh, Pa.	Dart	Ensminger Garage.
Herkimer, N. Y.	Stewart	G. E. Clark.
Hudson, N. Y.	Stewart	Wm. Petry Garage.
Jacksonville, Fla.	Urban	Jacksonville Electric Gar. Co.
Johnstown, N. Y.	Stewart	Johnstown Motor Car Co.
Kingston, N. Y.	Stewart	Van's Garage.
Kittanning, Pa.	Adams	Fisher & Lambing.
Long Beach, Cal.	Stegeman	Wire & Lee.
Los Angeles, Cal.	Autocar	M. S. Bulkley & Co.
Los Angeles, Cal.	Lewis	Pacific Coast Motor Car Co.
Newburg, N. Y.	Stewart	The Van Motor Co.
Newark, N. J.	Atlantic	Hoagland-Thayer, Inc.
New York City	Harvester	Harvester Truck Co.
Oakland, Cal.	Lewis	Keystone Motor Car Co.
Omaha, Neb.	Dart	McIntyre Auto Co.
Poughkeepsie, N. Y.	Stewart	John Van Benschoten.
Providence, R. I.	Stewart	Edgewood Garage.
Richmond, Va.	Atlantic	D. J. Baker.
San Francisco, Cal.	Indiana	Auburn Sales Co.
Saskatoon, Sask.	Stewart	G. H. Hack.
Savannah, Ga.	Indiana	Cassels Co.
St. Louis, Mo.	I-H-C	International Harvester Co.
Syracuse, N. Y.	Stewart	Syracuse Garage.
Tama, Ia.	Dart	Harlan & Cary.
Troy, N. Y.	Stewart	Payne Automobile Co.
Vallejo, Cal.	Lewis	E. J. Knox.
Winona, Minn.	Four Wheel Drive	Ben Kalmes.

ELECTRIC VEHICLES

Los Angeles, Cal.	Atlantic	G. A. Johnston.
Montreal, Can.	Atlantic	A. Jennings & Co.
Montreal, Que.	Tate	Tate Electric Garage.
Toronto, Ont.	Baker	Pope Hartford Motor Co.
Toronto, Ont.	Standard	Masco Co.

HENRY S. CHAPIN, New York City, has invented a new type of rebound check which is distinguished by effectiveness, smoothness of action and light weight, in addition to the extraordinary simplicity and consequent low cost of manufacture. In short, the device shown in Figs. 11 to 13 consists of a flat bar or plate secured to the masterleaf of an elliptical spring, on the free side of the same, its length and rigidity being so proportioned as to afford a resistance to spring rebound. The end edge of the plate bearing against the spring is rounded.

As Fig. 11 shows, one of the simplest forms in which this spring check may be applied, consists in placing a plate shaped to contact with the central portion of the masterleaf in such a position that it is in touch with the concave side of it, when the spring is under normal load. If the car travels, the spring, of course, begins to vibrate, thereby tending to alter its shape continually from moment to moment. The plate P, being more rigid than the spring steel, does not follow the alterations of the shape of the spring, but its rounded edge is made to slightly slide along the spring surface, due to its curvature and by its changing point of contact helps considerably to counteract and annihilate vibration, first, of the masterleaf and through this of the other leaves.

In case of a shock, when the masterleaf of the spring tends to curve itself beyond normal, the plate comes into principal action. Thanks to its rigidity, it cuts—so to speak—each side of the spring in two parts; namely, that covered by the plate and the remaining portion. The rounded edge of P provides a fulcrum, almost stationary due to the rigidity of the material, around which the outer portion of the spring must turn. As the spring leverage is considerably shortened by moving the fulcrum from the end of the U-bolt to the edge of P—as is done by the use of the plate—the force acting at the end of the spring and which otherwise would result in a considerable deformation of the same is reduced very much and the deformation proportionately. In other words, the short leverage from the edge to the end of the spring masterleaf makes excessive deformation very difficult and frees the ordinarily sudden return to normal shape from the shocking nature otherwise accompanying it. One of the main reasons for the action of this spring check is the fact that the check-bar or plate P and masterleaf are always in contact at their common point of attachment as well as at the edge of the plate, so that a sudden jumping action on the part of the spring leaf is impossible. In addition, there is the devibrating effect of the plate.

Rushmore Electric Starter—S. W. Rushmore, of the Rushmore Dynamo Works, Plainfield, N. J., has designed a starter of the electric-motor type which is operated by the simple pressing of a button mounted in reach of the driver's hands. If this is done, a pinion of the armature is brought into engagement with a gear formed on the flywheel periphery.

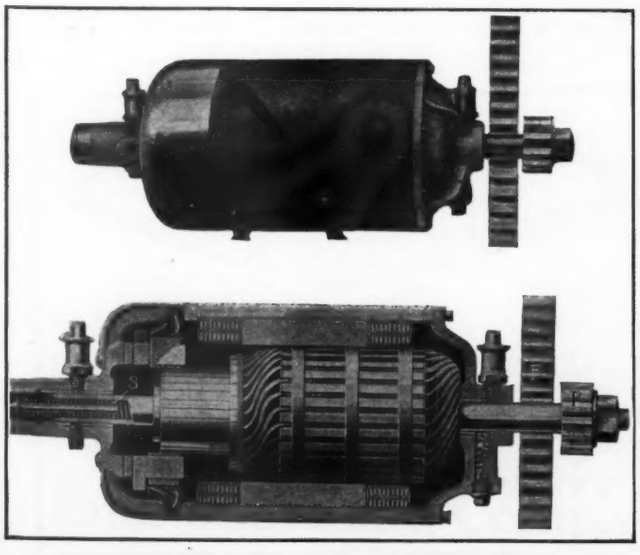
The starter which consists of the motor and pinion, weighs 47 pounds. It is constructed with a 6-volt series winding, both for the general use of this voltage in lighting systems and because a higher operating efficiency is claimed for it than if a higher voltage were used. One of the most interesting, and in fact, most ingenious features of the device is the device for engaging and disengaging starter gear and flywheel. It consists of a compression spring S contained in the hollow armature shaft, which presses the latter and the armature out of its central or working position, so that pinion P and the gear F on the flywheel remain out of engagement. When the circuit is closed, the field is magnetized and by this action is made to draw into the working position the armature, on the principle of the solenoid. Thereby P and F are brought into engagement and the flywheel is turned over by the torque of the electric motor. As soon as the engine picks up above the speed of the starter, the latter is relieved of its load, the current drops and almost becomes nil, thereby permitting the spring to press the armature out of the operation position and to disengage the gears P and F.

Perfectite Waterproof Compound—The Price Fire & Water-Proofing Co., Poughkeepsie, N. Y., has begun to market a waterproofing compound which comes in a semi-solid form, being inclosed in cans and which may be made ready for application by thinning with gasoline, linseed oil or any other drying oil. It is furnished in 1, 2 and 5-pound cans, as well as in kegs of 25 and 100 pounds. Two pounds of Perfectite should be dissolved in 1 gallon of liquid and such a mixture is sufficient for waterproofing 100 square feet of canvas, top material, or the like.

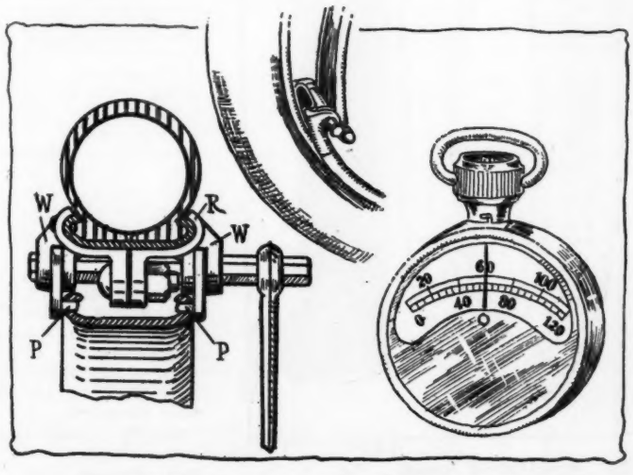
Funk Demountable Rim—Richard W. Funk, 1876 Broadway, New York City, is the maker of the demountable rim illustrated in Figs. 3 and 4. The rim proper is a split ring, the ends of which are connected by a pin-link mechanism, as in Fig. 4. One pin serves as a fulcrum, around which the other may be moved by applying a wrench to the hexagonal head formed on the pin, so that the two rim ends may be brought into alignment and contact. When this is the case, the rim, formed as at R, Fig. 3, forms a secure basis for the casing and the inner tube contained in it.

Rust-No Graphite—Asch & Co., 1777 Broadway, New York City, handle graphite stick shown in Fig. 16. It consists of graphite and a binder, being used to prevent rusting on of tires.

Edelmann Watch-Type Tire Gauge—E. Edelmann & Co., Chicago, have brought out a tire gauge, Fig. 5, in the shape of a watch which is fitted with a ring, so as to be adaptable for carrying on a chain. The size of the gauge is that of a small Ingersoll watch, and the appearance also resembles this, being contained in a nickel casing. The air which acts on the indicator mechanism enters through the stem portion of the casing, which portion is so designed as to fit any Schrader valve. The device works on the principle of the steam gauge; the indication remains and is released by pressing an extension of the indicator hand through the frame.



Figs. 1-2—Rushmore electric engine starter



Figs. 3-4—Funk rim. Fig. 5—Edelmann tire gauge

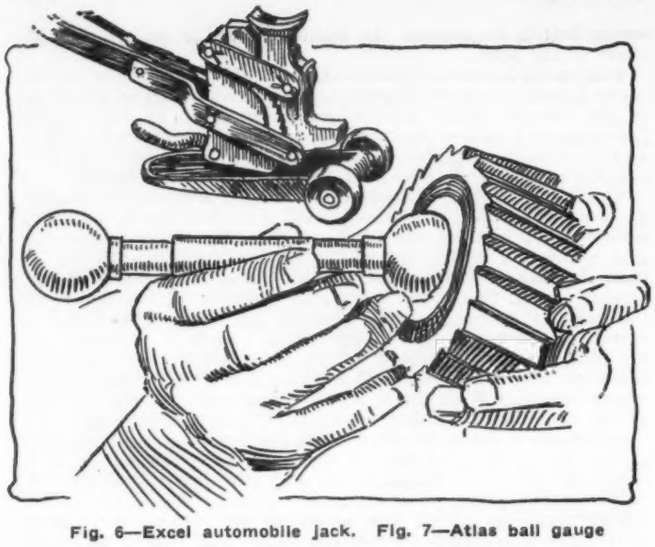


Fig. 6—Excel automobile jack. Fig. 7—Atlas ball gauge

The Excel Auto Jack, Fig. 6, designed for use in garages and tire agencies, is mounted on a wheeled base and provided with a long hand lever for quick and easy jacking. The housing is of crucible cast steel and all teeth are machine cut. The weight is 35 pounds and the height range from 9 inches lowered to 25 inches raised. The change from up to down movement is effected by a small thumb lever in a convenient position on the operating handle. These jacks are the product of the Excel Jack Mfg. Co., Fenway, Boston, Mass.

The Detroit Automobile Fire Extinguisher Co. has brought out the extinguisher shown in Fig. 9, which is furnished in either nickel or black enamel to match the trimming of the car.

It is so constructed that the operator can quickly detach the connecting tube from the end brackets by grasping same next to the spring clip. One quick pull releases the tube and it is thus open ready for action and can be thrown directly on the flame.

This extinguisher is made with two types of mountings, so that it can be screwed to the tonneau floor and used as a foot rail fixture or attached to the dash. In the latter case the brackets are shorter. The dash equipment is made in two sizes, that for pleasure cars being 12 inches in length and 2 inches in diameter, while the truck type is a heavier tube of steel measuring 20 inches by 2 inches. The foot-rail equipis 12 inches by 2 inches.

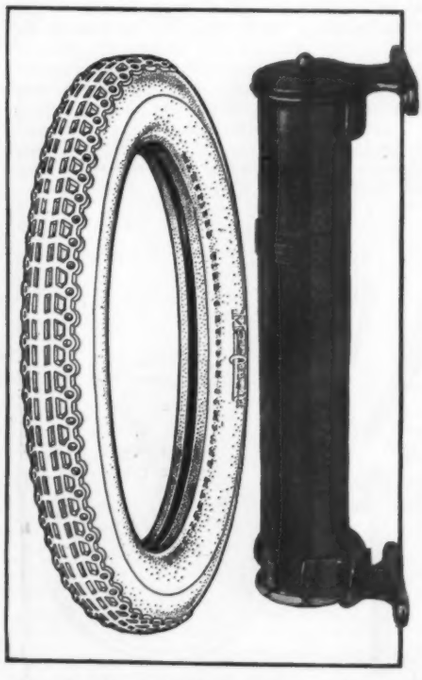


Fig. 8—Mansfield tread. Fig. 9—Detroit extinguisher

Stanley Hinges—The automobile hinges of the Stanley Works, New Britain, shown in Fig. 10 give evidence of accuracy in manufacture that will prevent rattling when in use. They are supplied in wrought steel 1.5-, 1.75- and 2-inch sizes. The lengths range from 2 to 5 inches and the makers punch and countersink the screw holes according to the specifications of the purchaser. The makers are also prepared to execute orders for hinges of any special size or shape.

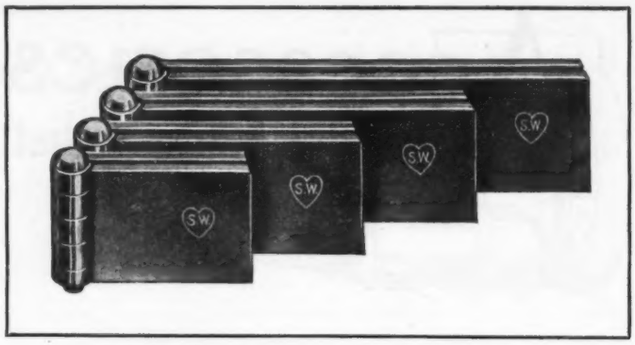


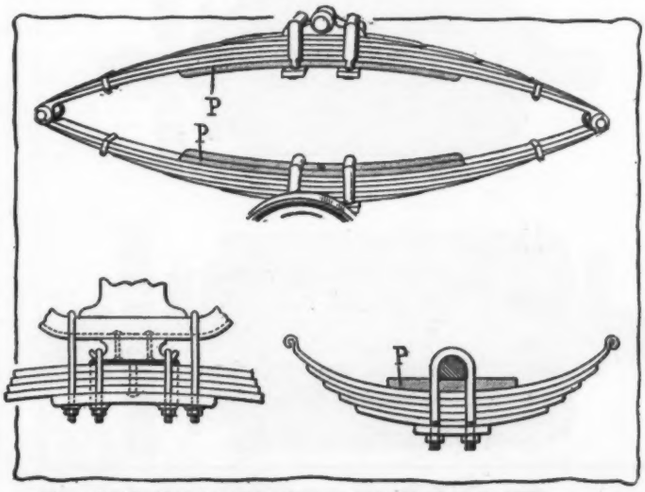
Fig. 10—Stanley hinges for automobile doors

A new non-skid tread has been brought out by the Mansfield Tire & Rubber Co., Mansfield, O. It has five parallel cables which are connected by cross-bars in M manner. These bars are space .75 inch to provide hollows which grip the road surface. It is claimed by the maker that the uneven surface of the tread not only gives good traction but that the spaces formed between the cross bars prevent side skidding.

The illustration shows that the principle used in this casing is not new, but well tried out before; but a new and pleasing shape has been found, which undoubtedly is accompanied by a number of distinct advantages.

The Atlas Ball Gauge consists of a hardened and accurately ground steel sphere welded to a handle. Its purpose is the accurate measurement of internal diameters. In use the spherical shape facilitates the insertion of the gauge and also renders the operation of taking a measurement much simpler as the handle can be held at any angle to the part being measured. These gauges are guaranteed to .0001 inch and for the gauging of the shaft hole in gear wheels, etc., they are made in a double type as shown, in which one ball is called the "go" end and the other the "no go" end. The machined part can be passed when the hole is such that the smaller ball, the "go" end, can be entered but the larger or "no go" end cannot. These gauges are made by the Atlas Ball Co., Philadelphia, Pa.

Miller Grease Gun—The manufacturer of the Miller grease gun, Fig. 14, has brought out the new grease scoop, Fig. 15, so as to make charging of the gun easy. The gun here shown is made of brass throughout, consisting of four parts: The cylinder and cap fastened to it, the leather-packed piston reciprocable in it by turning the screw-cut rod formed with a pentagonal handle, the removable cat at the opposite end and the spout screwing into hole in its center. The leather washer fitting around the piston makes a tight joint with the inside of the gun cylinder and the removable cap fits the latter tightly, so that all grease put into the gun is positively discharged by way of the spout if the handle is turned. The scoop is stamped from a single strip of steel and is slightly bent along its longitudinal center line so that it easily picks up the lubricant. The other end of the scoop is cut, as shown in the illustration, so as to form a handle. This scoop is furnished gratis with the grease gun. Asch & Co., New York City, are distributors for this article.



Figs. 11-13—Sterling-Chapin rebound check for springs

This Display Stand Will Sell Bumpers For You

HIGH GRADE BUMPERS
2 IN. TUBE BAR NICKEL
2 IN. CHANNEL BAR NICKEL
2 IN. CHANNEL BAR BLACK
CADILLAC BUMPER 1½ IN. TUBE BAR NICKEL
1¼ IN. TUBE BAR NICKEL

The demand for bumpers is here *now.* Every car should be fitted with one—some with *front and rear.*

This compact bumper stand displays five full size models of E. G. HOOKBOLT Bumpers—in nickel, black and brass—for nearly all makes of cars. The stubs to which the bumpers on the stand are attached are patterned after automobile spring hangers in order to demonstrate that E. G. Bumpers may be applied to the frame without drilling.

To obtain one of these stands FREE, it is only necessary to purchase five bumpers as shown in the cut, at trade prices.

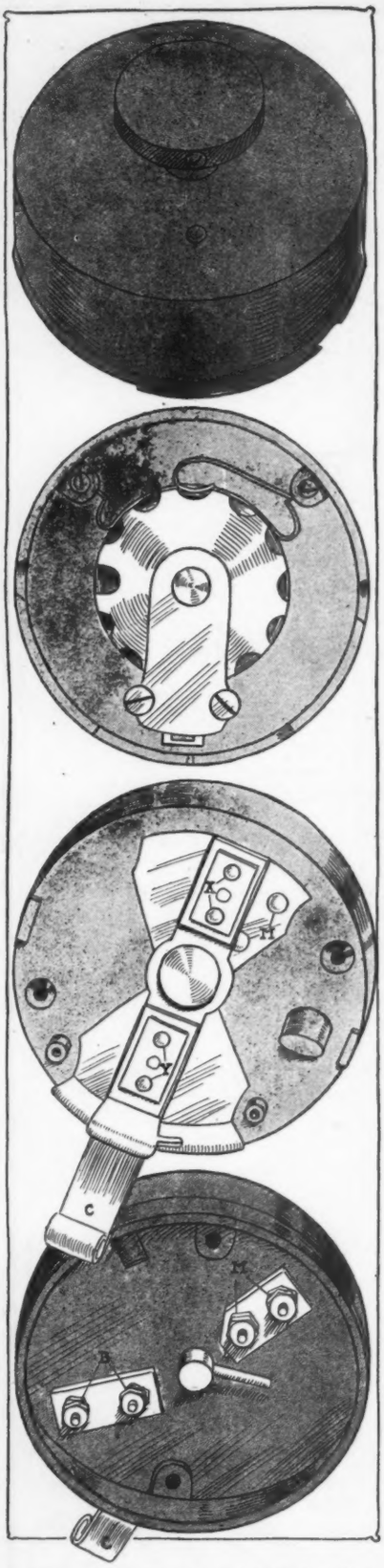
	List.		List.
1¼ in. Round Bar Bumper, Black	$6.75	2 in. Round or Channel Bar, Black	$10.00
1¼ in. Round Bar Bumper, Brass	7.50	2 in. Round or Channel Bar, Brass	12.50
1¼ in. Round Bar Bumper, Nickel	9.00	2 in. Round or Channel Bar, Nickel	15.00

Cadillac and Rear End Bumpers

Same prices as above, according to style and finish of bar.

Bumpers are shipped assembled on the stand—ready for the display room—no bother or work.

Emil Grossman Company Manufacturer **250 W. 54th St., N. Y.**



Figs. 18-21—Amper electric lock switch. The top shows the outside front view, the second illustration the inside of the front section, the third the inside of the back section, and the bottom view the outside rear view, with connections.

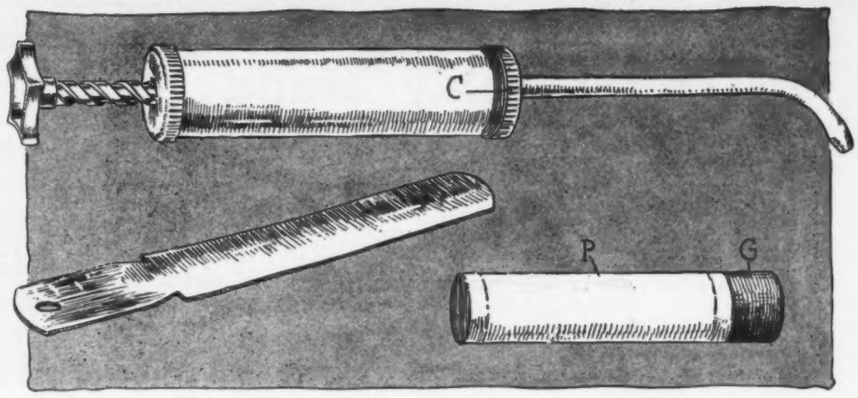


Fig. 14—Miller grease gun. Fig. 15—Miller grease scoop. Fig. 16—Rust-No stick

Motor Car Equipment Horn.—The Motor Car Equipment Co. of New York City has taken up the sale of a novel automobile signal which combines the clearness of the bulb-horn note with the ease of operation otherwise obtained only from electric or exhaust-operated signals. The new horn is shown in Fig. 17. It consists of two principal units, namely, the bulb horn and the small air pump which impels the air used for producing the sound in the horn. As Fig. 17 shows, the pump is mounted so that the wheel attached to it does not touch the flywheel rim, but is brought into contact with it if the lever to which he Bowden wire is attached is drawn forward toward the small wheel's shaft. This is done by pressing upon a small lever shaped like a pedal and mounted on the rim of the steering wheel, as here illustrated. The Bowden wire proper is enclosed in a flexible tube which is so mounted that pressure upon the small lever does not move it, but the wire passing through it. The pump thus operated, by the force of the flywheel contacting with the small wheel, produces an intense current of air which is taken in at the opening of the pump casing fitted with a screen and discharged at the other opening of the casing, in the direction of the tangent of the impeller blade periphery. The air current is led through a heavily-woven metal braided casing to the intake of the horn, which is expanded into a ball-shaped space. From there it passes through the reed and the twice-coiled tube into the projector, whence it leaves the horn with great strength. The mounting of the pump is by means of bolts and nuts which fasten to the motor frame, while the horn proper is secured to the front of the dashboard or at a similarly suitable place.

Amper Lock Switch—A lock switch which is controlled by a combination lock is being made by the Amper Electric Co., Lockport, N. Y. Figs. 18 to 21 illustrate the construction of this lock. A knob on the front of the casing controls three cylinders cut in their peripheries to permit spring tumblers to drop into them if the knob is turned to the proper places. If this is done the spring tumblers arrest all three cylinders, one after the other, until certain slots formed in the cylinders are in alignment with the switch lever so that the latter may be turned moving the cylinders along with it. If the switch is then turned back to the off position a slight turn of the knob is sufficient to lock the device. On the back of the instrument connections are provided for the wire contact from battery and magneto to the spark-plugs.

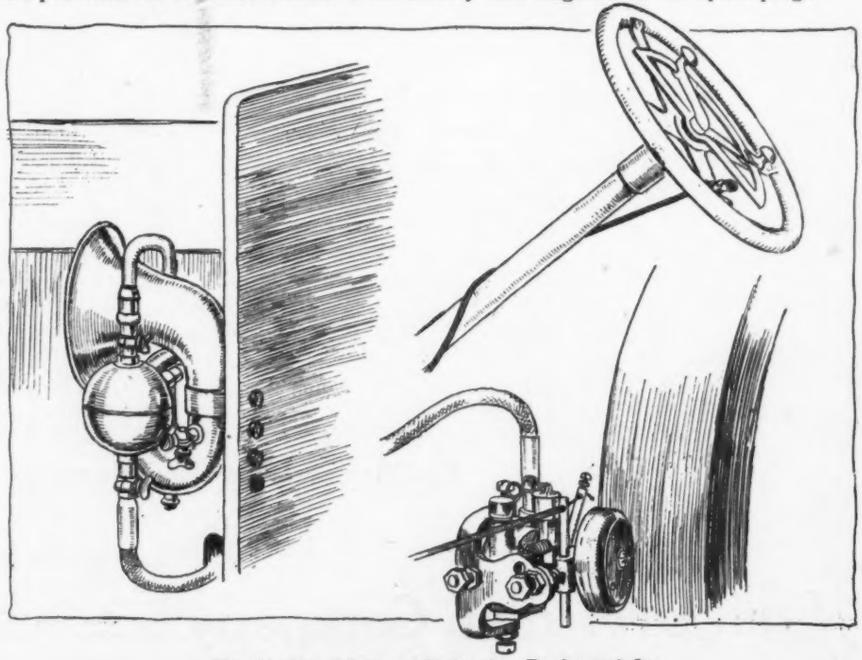


Fig. 17—Novel horn of Motor Car Equipment Co.